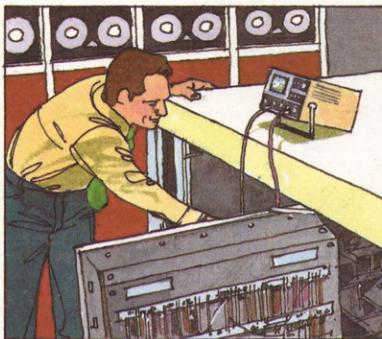
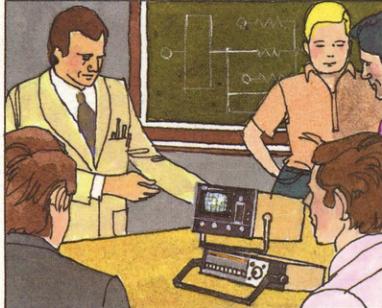
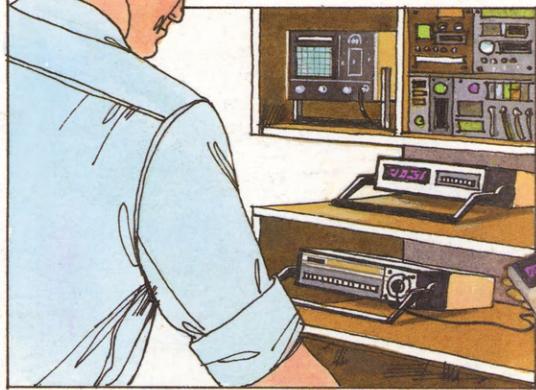


Test instruments

STODDARD SUPPLY CO., INC.
354 South Cannon Ave.
Hagerstown, Maryland 21740
[301] 733-3390



BK PRECISION

DYNASCAN
CORPORATION

**The most complete line of high-quality,
cost-effective test instruments available!**

These B&K-PRECISION products represent over thirty years of experience in designing and manufacturing high-performance instruments at reasonable prices.

Value-Engineered Instruments that Never Short-Cut Performance

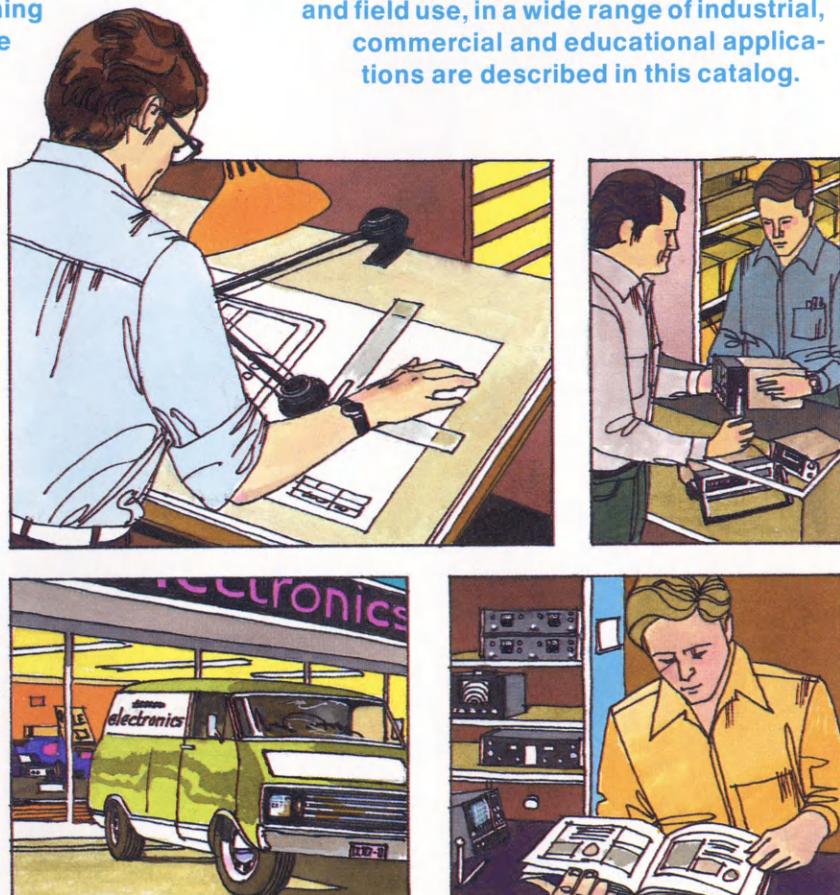
B&K-PRECISION conceives, designs, engineers and produces test instruments to perform their intended tests or measurements with the utmost cost-effectiveness. They are designed for everyday use, making them especially appropriate for dedicated applications such as production line testing, industrial maintenance and repair, field servicing and laboratory situations.

B&K-PRECISION instruments make it possible for you to buy all the equipment you need without paying for features or performance that you won't use. There are hundreds of thousands of satisfied B&K-PRECISION test equipment users who can attest to its dependability and reliability.

All B&K-PRECISION instruments are conservatively rated, so that their actual performance usually exceeds published specifications. Thus you can still use them confidently when your measurements reach the published ratings. In addition, B&K-PRECISION instruments are "human-engineered," so even inexperienced users can operate the equipment effectively and correctly.

B&K-PRECISION also offers a full line of accessory items, including probes designed for complete compatibility and interchangeability with those of leading ultra-sophisticated brands. This is another example of B&K-PRECISION planning for high-quality performance at substantial savings.

Test instruments for laboratory, production line and field use, in a wide range of industrial, commercial and educational applications are described in this catalog.



Immediate Delivery Through Electronic Distributors

The immediate availability of B&K-PRECISION products from stocking electronic distributors provides an important convenience factor. Your local distributor can give you fast, off-the-shelf delivery of any item in our line. There are no delays. You get the instrument you need, when you need it.

Your B&K-PRECISION distributor is a conveniently located, fully staffed, established source, one with whom your company can deal with regularly for components and supplies, as well as test equipment. Thus, he's anxious to serve you before and after the instrument sale. A trial unit can be obtained, for your examination, from most B&K-PRECISION distributors. B&K-PRECISION's nationwide network of distributors reduces selling

costs...which in turn reduces prices to you for B&K-PRECISION products.

Prompt Local Service

Should problems arise, B&K-PRECISION maintains fully qualified local service centers in every major metropolitan area. Again, because you deal with a local source, repair operations, though rarely needed, are prompt and courteous.

Most Complete Instruction Manuals in the Industry

You'll also be pleased with the instruction manual that accompanies each B&K-PRECISION instrument. Our comprehensive manuals cover all the test procedures, applications, operation and circuit theory of the unit. They are so clearly written and well illustrated that they are frequently used as classroom instruction texts and in-plant training material.

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About this catalog...

B&K-PRECISION has always felt that the best way to help you make an intelligent instrument buying decision is to provide all of the relevant information in an easy-to-understand catalog format.

Each instrument description includes an unabridged specification section in a standardized format. This allows you to compare instruments within our line quickly and without confusing changes in terminology. Unlike some manufacturers, we do not hide key specifications in confusing language or "numbers game" tactics. Whenever you're contemplating a purchase, we invite you to compare our specifications to those of any other manufacturer. You'll be able to easily judge for yourself which company is providing the most complete story and which products offer the greatest value.

This catalog also highlights the most popular applications for our test instruments and their key features. We do this to help you consider present and future applications before you make your purchase. Before you purchase more expensive equipment to "play safe," browse through this catalog. You'll be amazed at what B&K-PRECISION instruments can do, and you'll be pleasantly surprised to learn how much money you can save!

DYNASCAN CORPORATION

The Electronic Test Instruments Group of Dynascan Corporation is the source of the B&K-PRECISION brand of test instruments and accessories.

Equally respected are the products of the CB Communications Group, which include the pre-eminent COBRA line of Citizen's Band radios/Telemotive precision radio control systems for cranes, and other heavy industrial equipment.

Dynascan Corporation sales for 1977 exceeded \$84,000,000—establishing it as a major producer of electronic products for industry and consumer use.

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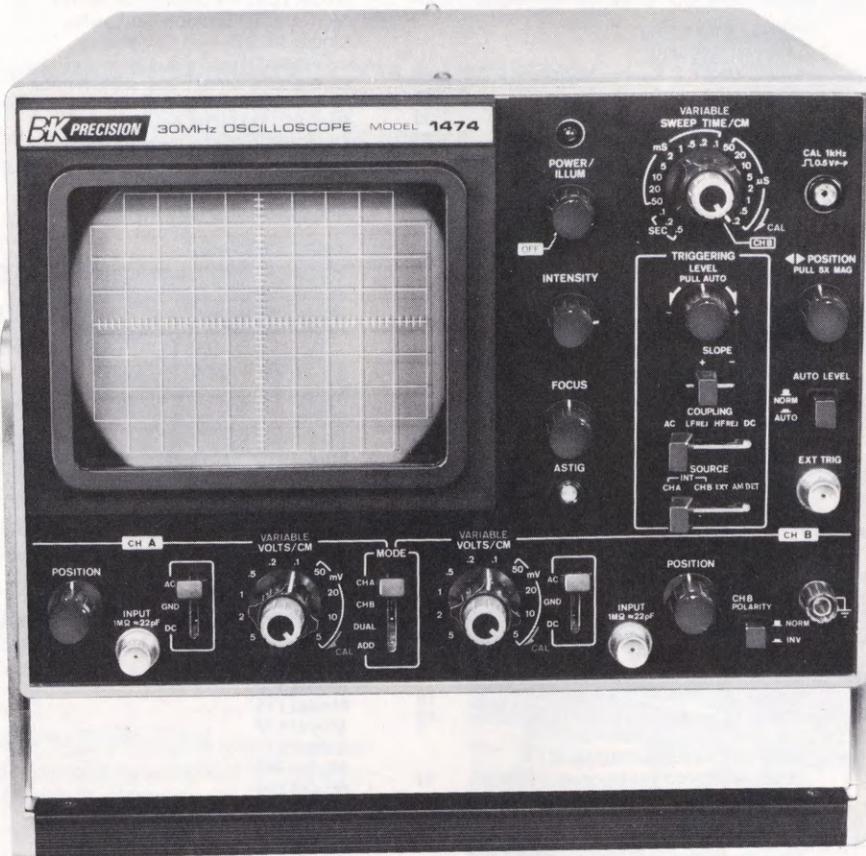
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Dual-Trace 5" 30MHz Triggered Scope...



MODEL 1474

- Rise time 11.7 nS or less
- Built-in signal delay line permits view of leading edge of high frequency pulse rise time
- Triggers on signals up to 50 MHz
- 5mV/cm vertical sensitivity
- Mode automatically shifts between CHOP and ALTERNATE as you change sweep time
- Checks most digital logic circuitry, including ECL
- High accuracy ten position vertical input attenuator
- Flat response with smooth rolloff past 30 MHz
- PDA CRT with P31 phosphor
- Built-in high- and low-pass filters
- Maintains calibration accuracy from over 105-130 VAC and 205-260 VAC
- 20 calibrated sweeps—0.2 μ s/cm —0.5 S/cm
- Differential input capability
- Algebraic addition and subtraction
- Built-in RF detector for modulation envelope display
- Illuminated graticule
- Probes included

APPLICATIONS

Microprocessors system development... Analysis and troubleshooting of mini-computer and microprocessors... Computer terminals... Video character generators... Video games... Broadcast studio application... Monitor CB waveforms, both AM and SSB... Monitor digital data transmissions... Logic and digital design work and troubleshooting, including electronic organs, counters, calculators, phase-locked-loops, DMM's and synthesizers... Check the divider network of any system using TTL, DTL, RTL and most ECL logic... Measure propagation delays and phase shifts... Trouble-

shoot and maintain video recording systems and equipment... Set sync, video and color burst levels in video systems with extreme accuracy... Use A-B mode to compare amplifier input/output waveforms and display algebraic difference as a distortion curve.

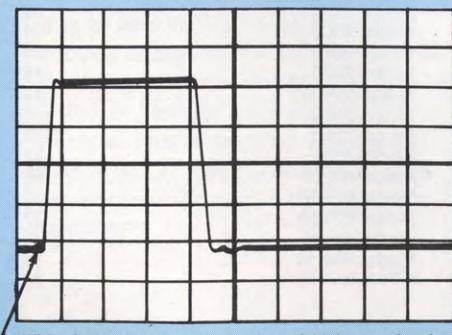
FEATURES

11.7nS rise time...30 MHz dual trace operation... Internal signal delay line... 21 position sweep switch... Intensity modulation compatible for 5V p-p... Illuminated graticule... Internal 0.5 V p-p \pm 1% calibration

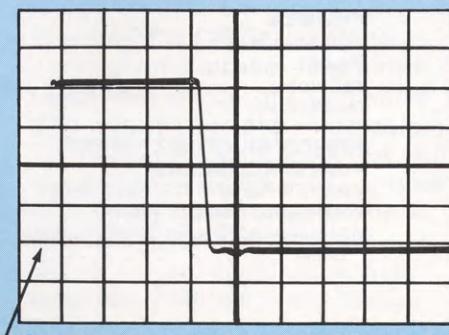
source... 100% solid state (except CRT)... Meets CSA requirements... X-Y Vector-scope capability... High performance/cost ratio... AUTO LEVEL features greatly reduces manual trigger level adjustments and saves time.

The B&K—PRECISION Model 1474 represents a significant price breakthrough in a 30 MHz scope. The 1474 is a true 30 MHz dual trace scope; capable of triggering on signals up to 50 MHz. Vertical sensitivity is an outstanding 5 mV/cm.

SIGNAL DELAY GIVES YOU MORE INFORMATION...



With signal delay, leading edge of high speed pulse is visible.



Conventional scope without delay fails to display leading edge of pulse.



RACK MOUNTING KIT

Model RM-14 Rack Mounting Kit includes everything needed to mount the B&K PRECISION 1474, 1472C, 1471B or 1461 oscilloscopes in a standard 19" rack. Panel, hardware and complete instructions provided.

Lowest price delay line 30MHz scope

An important special feature of the 1474 is a display signal delay. This feature will allow you to view information appearing during the very short rise and fall times of high-frequency waveforms. The internal delay line delays the trace without altering triggering speed.

The 30 MHz bandwidth and high accuracy of the 1474 makes it ideally suited for developing and servicing microprocessor controlled systems. Short duration pulses that are unviewable on other lab scopes are clearly viewable when expanded on the 1474. Rise time is 11.7 nS or less. The job of servicing mini-computers and process control computer systems goes much more smoothly when you actually see the required pulses and compare them with manufacturers' data. The combination of 30 MHz bandwidth and delayed sweep assure you that the 1474 will not become obsolete as faster microprocessors are developed. The 1474 is also an excellent diagnostic aid for servicing electronic cash registers, intelligent data terminals and video character generators.

In communications servicing and teaching, the ability of this scope to trigger on signals up to 50 MHz gives it great versatility. Whether the input signal is a modulation pattern or a data transmission, results will be excellent. Signals can also be viewed at

VHF IF frequencies without a demodulator probe. Modulation patterns can be displayed by selecting the built-in AM detector.

Waveforms are displayed with high resolution and brightness on an 8 x 10 cm CRT viewing area. Built-in time saving features include chopped or alternate mode of display, automatic triggering and lever switches. The ten position vertical attenuator covers 5 mV to 5 V per cm at an accuracy of $\pm 3\%$.

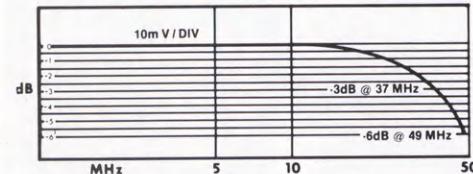
The 1474 power supply is very conservatively rated and handles periods of extended operation without effort. Regulation circuitry is extensive for both low- and high-voltage supplies. Because of this design, calibration accuracy can be guaranteed to remain constant over a 105-130VAC supply voltage range. Incredibly, the 1474 requires only 25 watts of power.

Virtually all of the 1474's circuitry is contained on mating plug-in boards, providing a clean and easy-to-maintain layout. Most front panel controls are pc board mounted with shaft extensions. This design allows high quality-control at an economical price.

Internal low- and high-pass filters offer greater control over triggering range. Signals above 30 kHz can be attenuated or signals below 10 kHz can be attenuated. This

feature allows you to trigger on complex waveforms without waveform jitter. Filters are front panel switch selectable.

FLAT RESPONSE CURVE



The 1474 has smooth response to well beyond 30 MHz. There are no in-band phase and amplitude errors caused by variations in frequency response. Response is typically down only 6dB at 49 MHz. This flat and predictable response means accuracy you can depend on. In TV broadcast and CATV systems, this accuracy can mean consistent picture and color quality. Color programming from studio cameras, video recorders, film chains and network feeds can all be precisely balanced. For close examination of system performance, display the vertical interval test signal (VITS). You can even monitor the digital signals of studio character generators and video tape edit codes.

SPECIFICATIONS

VERTICAL AMPLIFIER (Channel A and Channel B)

Deflection Factor: 5mV/cm to 5V/cm, $\pm 3\%$ in 10 ranges, each with fine adjustment.

Frequency Response: DC, DC-30MHz (-3dB); AC, 10Hz-30MHz (-3dB).

Rise Time: 11.7 nS or less.

Overshoot: 3% or less.

Input Impedance: $1M\Omega \pm 2\%$, 22 pF (± 3 pF).

Tilt: less than 5%.

Non-Distorted Maximum Amplitude: more than 40mm at 30MHz; more than 80mm at 10MHz.

Maximum Input Voltage: 300V DC + AC peak or 600 V p-p.

Operating Modes: CH-A, CH-B, Dual, Add and subtract (using CH B INVert). ALT 0.2 μ S/cm—0.5 mS/cm. CHOP 1 mS/cm—0.5 S/cm. Dual Trace—trace automatically chopped at all sweep times of 1mSEC/cm and slower, alternate mode automatically selected for all faster sweep times.

Chop Frequency: 200 KHz $\pm 20\%$.

Signal Delay: Fixed, 12 nS minimum visible delay.

CH B Polarity: NORM; INV. (Provides CH A minus CH B function).

Channel Separation: Better than 70dB at 1 KHz.

SWEEP SYSTEM (Common to Channel A and Channel B)

Type: Automatic and triggered (NORM) Mode (X-Y operation) CH A = Y, CH B = X.

Sweep Time: 0.2 μ S/cm—0.5 S/cm $\pm 3\%$ in 20 calibrated steps in a 1-2-5 sequence with vernier adjustment.

Sweep Magnification: x5 (five times) $\pm 5\%$. Extends maximum sweep rate to 40nS/cm.

Linearity: 3% or better; 5% with 5x magnification.

TRIGGERING

Source: CH A, CH B, EXT, and EXT/10.

Automatic: Sweep is triggered at the average amplitude of the displayed signal.

Normal: Sweep is obtained with a displayed signal amplitude of one cm, or less. The point on the displayed waveform at which the sweep starts is determined by the SLOPE and LEVEL controls.

Slope: Sweep can be set to trigger on the positive or negative going slope of the trigger waveform.

Coupling: AC, DC, LF reject, HF reject. (AC) 30Hz-30MHz. (LF reject) signals below 10kHz are attenuated. (HF reject) signals higher than 30kHz are attenuated.

Level: Continuously variable. Pull for AUTO (Sweep is obtained without an input signal).

TRIGGER SENSITIVITY

Coupling	Bandwidth	Minimum Sync Voltage	
		INT	EXT
AC	20Hz-5MHz	0.3/DIV	0.1Vp-p
	10Hz-30MHz	1/DIV	0.5Vp-p
LF Rej	10kHz-5MHz	0.3/DIV	0.1Vp-p
	10kHz-30MHz	1/DIV	0.5Vp-p
HF Rej	20Hz-30kHz	0.3/DIV	0.1Vp-p
	10Hz-30kHz	1/DIV	0.5Vp-p
NORM	DC-5MHz	0.3/DIV	0.1Vp-p
	DC-30MHz	1/DIV	0.5Vp-p
DC	10Hz-5MHz	0.3/DIV	0.1Vp-p
	10Hz-30MHz	1/DIV	0.5Vp-p
AUTO	10Hz-5MHz	0.3/DIV	0.1Vp-p
	10Hz-30MHz	1/DIV	0.5Vp-p

HORIZONTAL AMPLIFIER (X-AXIS): Input through Channel B vertical input.

Deflection Factor: 5mV/cm, to 5V/cm, $\pm 5\%$, in ten ranges, each with fine adjustment.

Frequency Response: DC-1 MHz (-3dB).

Input Impedance: 1 megohm (nominal), shunted by 22 pF (± 3 pF).

Input Protection: 300 VDC + AC peak, or 600V p-p.

X-Y Operation: With SWEEP TIME/CM switch in CH.B position, the CH.B input becomes the X input (horizontal) and the CH.B position control becomes the horizontal position control.

Z-AXIS INPUT (Intensity Modulation)

Sensitivity: 5V(TTL compatible).

Usable Frequency Range: DC to 5MHz.

Input Impedance: 10k

OTHER SPECIFICATIONS

Operating Environment: 0°C to +45°C.

Calibration: Internal 0.5 V p-p $\pm 1\%$ (square wave at 1kHz $\pm 10\%$).

CRT: 5" PDA (approx. 4kV) with P31 phosphor.

Power Requirements: 117/234 50/60Hz, 25 watt. (Calibration will remain constant over 105 to 130VAC input).

Size without handle: (HWD) 18.4 x 25.3 x 36.9cm (7-3/8 x 10-1/8 x 14-3/4").

Weight: 8.8 kg (19.6 lbs.)

Probes: Two PR-36 probes supplied. Optional LC-74 protective cover available.

New 15MHz portable 3" dual-trace scope



MODEL 1432

- 15MHz bandwidth with smooth roll-off; usable response extends beyond 30MHz
- 2mV/div. vertical sensitivity
- Operates on 117VAC, 234 VAC, 12VDC or optional internal battery pack
- Fully regulated high- and low-voltage supplies
- Algebraic addition and subtraction of Channel A and B input signals
- Nineteen calibrated sweep ranges cover 0.5 microsecond to 0.5 second
- TTL Compatible Z-axis input
- Compact size; measures only 5.5 x 8.25 x 14.3"
- Includes two slim-body 10:1/direct probes and accessory tips
- Built-in sync separators

APPLICATIONS

Field or lab troubleshooting, including electronic organs, counters, calculators, phase-lock-loops, DMM's and synthesizers... Logic and digital design...Check the divider network of any system using TTL and most ECL logic...Measure propagation delays and phase shifts...Troubleshoot and maintain video recording systems and equipment...Use built-in TV-V and TV-H sync separator circuits to monitor video...Set sync, video and color burst levels in video systems with extreme accuracy...Use A-B mode to compare amplifier input/output wave forms and display algebraic difference as a distortion curve...Video recorder alignment.

FEATURES

Can operate from any of four power sources...2 mV/div vertical sensitivity...24nSEC risetime permits accurate display of high-speed square wave pulses...Dual-trace display...Individual vertical sensitivity and positioning controls...8 x 10 div rectangular viewing area...P31 phosphor...5x magnification for maximum sweep speed of 0.1 μ SEC/cm...19 calibrated sweep ranges

...TTL compatible intensity modulation (Z-axis) input for time or frequency markers...Internal calibration source...100% solid state (except CRT)...Very compact, lightweight and rugged...Fully regulated high- and low-voltage supplies.

The B&K-PRECISION Model 1432 is a compact, portable dual-trace scope with more features than many lab scopes. Bandwidth is very conservatively rated at 15MHz, with an outstanding vertical sensitivity rating of 2mV per division.

With optional battery pack, the 1432 will "go where you go," bringing lab performance to the field. A built-in universal power supply provides operation on 117 or 234 VAC, or 12VDC. Both high- and low-voltage power supplies are fully regulated, maintaining time-base and amplitude accuracy over a wide range of input voltages. Because the 1432 was designed for field or lab use, there has been no sacrifice of features for compact size. Mode functions include algebraic addition and subtraction for the viewing of distortion products of input and output signals. Nineteen calibrated sweep ranges cover 0.5 microsecond to 0.5 second. A 5x

magnifier provides sweeps to 100 nanoseconds. Timebase linearity is $\pm 3\%$.

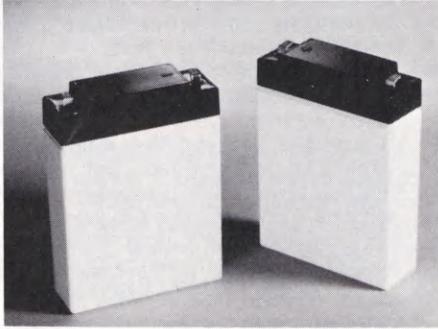
For most efficient operation, the 1432 automatically selects chopped or alternate mode of display. Selectable positive or negative slope triggering allows trigger point to be set on a positive or negative alternation. Other time saving features include automatic stability control and front-panel X-Y operation. Since the matched vertical amplifiers are used for both vertical (CH A) and horizontal (CH B) inputs in the X-Y mode, the calibration accuracy of both channels is preserved. The horizontal input signal can therefore be measured in volts/division of horizontal deflection up to specified horizontal amplifier response. By using the matched CH A and CH B inputs, phase and amplitude errors due to unequal impedance loading are eliminated.

Waveforms are brightly displayed on the P31 phosphor of a three-inch CRT. The display graticule is calibrated in the conventional 8x10 division format. Each division measures 0.6cm. A TTL compatible Z-axis input permits intensity modulation of the

...battery or line powered

display over a 1MHz range. A positive voltage increases trace brightness; a negative voltage decreases brightness.

The 1432 optional battery pack will fully recharge on one overnight charging. In addition, when operated on AC power, the 1432



BP-32 BATTERY PACK

Provides a minimum of two-hours of continuous battery operation. Recharges overnight.

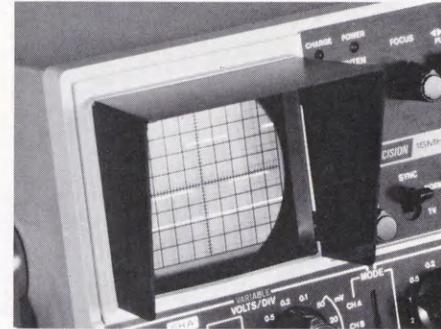
supplies a continuous trickle charge to the battery pack. An automatic charge limiting circuit absolutely prevents battery overcharge. A minimum of two-hours of continuous use is obtained when the batteries are fully charged.



PR-37 DELUXE PROBE

Bandwidth to 100 MHz. Two provided, (color-coded: one grey and one red) with four accessory tips and carrying pouch.

The B&K-PRECISION 1432 comes complete with two PR-37 slim-body 10:1/direct probes (four accessory tips and a carrying pouch are included with each probe), AC power cable, DC plug, viewing hood and detailed instruction manual.



VH-32 VIEWING HOOD

Shades CRT for viewing in high-brightness field locations. Detaches and folds flat for storage.

SPECIFICATIONS

VERTICAL AMPLIFIER

Deflection Factor: 2mV/div. to 10V/div., $\pm 5\%$, in 12 ranges, each with fine adjustment.

Frequency Response: DC, 15MHz (-3dB); AC, 10Hz-15MHz (-3dB).

Rise Time: 24nSEC or less. **Overshoot:** 3% or less.

Input Impedance: 1 megohm shunted by 22pF ($\pm 3pF$).

Non-Distorted Maximum Amplitude: More than 4 div. at 15MHz.

Maximum Input Voltage: 300V, DC + AC peak or 600V p-p.

Operating Modes: Channel A only; Channel B only; A & B (dual); A + B (add); A - B (obtained by inverting CH B when in ADD mode).

Dual-Trace: Trace automatically chopped at all sweep times of 1mSEC/div. and slower; alternate mode automatically selected for all faster sweep times.

Chop Frequency: 200kHz $\pm 20\%$.

CH B Polarity: NORM; INV. Selected by mode switch.

Channel Separation: Better than 60dB at 1kHz.

SWEEP SYSTEM

(Common to Channel A and Channel B)

Type: Automatic and triggered (NORM).

Sweep Time: 0.5 μ S/div.-0.5 S/div. $\pm 5\%$ in 19 calibrated steps in a 1-2-5 sequence with vernier adjustment.

Sweep Magnification: x5 (5 times) $\pm 10\%$. Extends maximum sweep rate to 0.1 μ S/div.

Linearity: 3% or better. 5% or better for 1 μ S/div. and 0.5 μ S/div. ranges.

TRIGGERING

Source: CH A, CH B, and EXT.

Automatic: Sweep is obtained without an input signal.

Normal: Sweep is obtained with a displayed signal of one division or more.

Slope: Sweep can be set to trigger on the positive- or negative-going slope of the trigger waveform.

TV Sync: Vertical and horizontal sync separator circuitry allows any portion of complex TV video waveform to be synchronized and expanded for viewing. TV-H (line) and TV-V (frame) sync switched automatically by SWEEP TIME/DIV switch. TV-V, 0.5SEC/div. to 0.1 mSEC/div.; TV-H, 50 μ SEC/div. to 0.5 μ SEC/div.

Coupling: AC, 20Hz-20MHz.

Level: Continuously variable.

Trigger Sensitivity:

INT. NOR:	20Hz - 10Hz/0.5 DIV
	20Hz - 15MHz/1DIV
AUTO:	50Hz - 15MHz/1DIV
EXT. NOR:	20Hz - 10MHz/0.5 V p-p
	20Hz - 15MHz/1 V p-p
AUTO:	50Hz - 15MHz/1 V p-p

External Trigger Input: Max. Input Voltage: 50V p-p or 24V, DC + AC peak. **Input Impedance:** 100k (nominal). **Input Capacitance:** 35pF (nominal).

HORIZONTAL AMPLIFIER

Input through Channel B vertical input.

Deflection Factor: 2mV/div., to 10mV/div., $\pm 5\%$, in 12 ranges, each with fine adjustment.

Frequency Response: DC to 1MHz (-3dB); AC, 10Hz to 1MHz.

Input Impedance: 1 megohm ($\pm 5\%$), shunted by 22pF ($\pm 3pF$).

Input Protection: 300VDC + AC peak, or 600V p-p.

X-Y Operation: With SWEEP TIME/DIV switch in CH B position, the CH B input becomes the X input (horizontal) and the CH B position control becomes horizontal position control. Mode (X-Y operation) CH A = Y, CH B = X.

Z-AXIS INPUT

Sensitivity: TTL compatible.

Usable Frequency Range: DC to 1MHz.

Input Impedance: 10k ohm $\pm 20\%$.

Maximum Input Voltage: 30 V (DC+AC peak).

OTHER SPECIFICATIONS

Operating Environment—Temperature: +0 to +50°C.

Altitude: Up to 4000 meters (13,124').

Humidity: Up to 95%.

Calibration: Internal 1V p-p $\pm 3\%$ (square wave at 1kHz $\pm 5\%$).

CRT: 3" (approx. 1.5KV) with P31 phosphor; full Mumental shield.

Power Requirements: 117/234 50/60Hz AC (selectable to 105-130V and 210-260V) or 11 to 15.5 VDC. Power consumption is 30 watts (AC). Optional battery pack available. (Minimum of 2 hours operation per charge.)

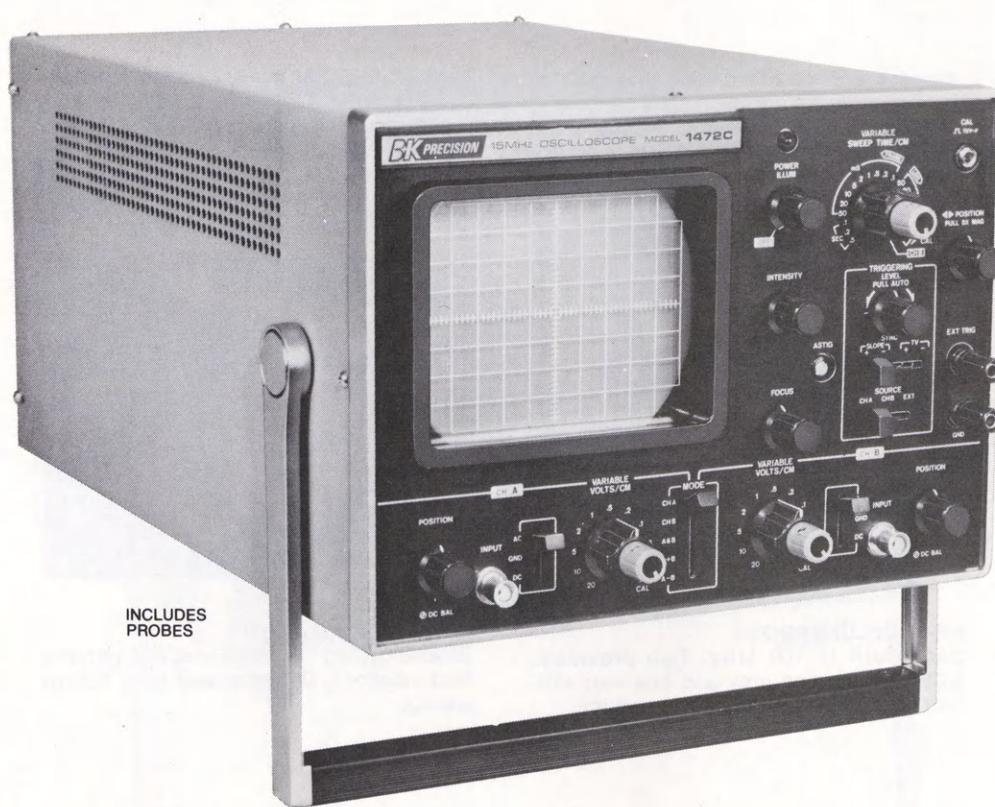
Size (Without Handle): (HWD) 14 x 21 x 36 cm (8.26 x 5.5 x 4.3").

Weight: 8.3 kg (18.3 lbs) with batteries.

Probes: Two PR-37 10:1/direct probes and accessory tips included.

Options: LC-132 protective carrying case, BP-32 battery pack.

Dual-Trace 5"-15MHz Triggered Sweep



MODEL 1472 C

APPLICATIONS

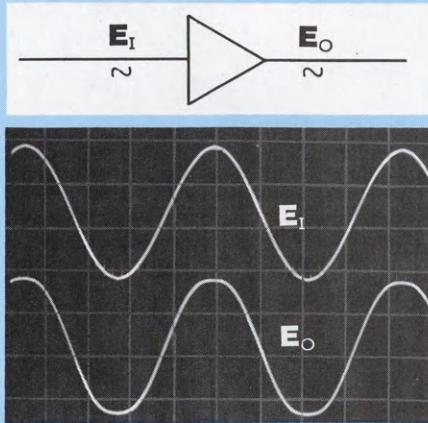
Logic and digital design and troubleshooting, including electronic organs, counters, calculators, phase-lock-loops, DMM's and synthesizers...Check the divider network of any system using TTL and most ECL logic...Measure propagation delays and phase shifts...Troubleshoot and maintain video recording systems and equipment...Use built-in TV-V and TV-H sync separator circuits to monitor video...Set sync, video and color burst levels in video systems with extreme accuracy...Use A-B mode to compare amplifier input/output waveforms and display algebraic difference as a distortion curve...Video recorder alignment.

FEATURES

24nSEC risetime permits accurate display of high-speed square wave pulses...Dual-trace display...Individual vertical sensitivity and positioning controls...Large 8 x 10cm rectangular viewing area...P31 phosphor...5x magnification for maximum sweep speed of 0.1μSEC/cm...Front-panel Vectorscope operation with matched-sensitivity inputs...19 calibrated sweep ranges...Intensity

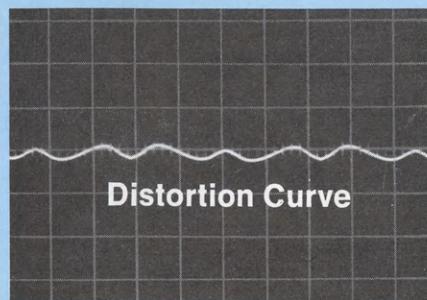
- Mode automatically shifts between CHOP and ALTERNATE as you change sweep time for fast set-up
- Bright P31 blue phosphor
- Flat in-band response with smooth rolloff past 15MHz
- Maintains calibration accuracy over 105-130VAC range
- Check most digital logic circuitry, including CMOS
- Front-panel X-Y operation using matched vertical amps
- Algebraic addition and subtraction
- Differential input capability
- 19 calibrated sweeps—.5μSEC/cm to .5SEC/cm

A-B MODE REVEALS AMPLIFIER DISTORTION

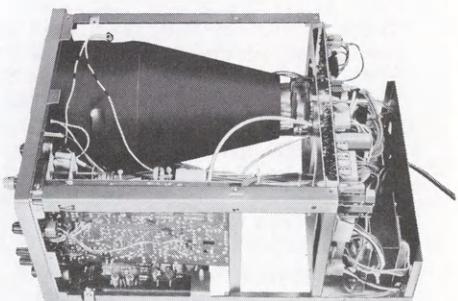


Comparing input (E_I) with output (E_O) seems to reveal little if any distortion. Algebraically subtracting E_O from E_I ...

$E_I - E_O = \text{DISTORTION}$



...reveals the curve above, which accurately represents distortion products.



Most circuitry of the 1472C is contained on single-sided plug-in circuit boards. Plug-in wiring harnesses are also featured. Construction throughout is clean and rugged—easy to maintain.

Scope... usable response through 27MHz!

modulation (Z-axis) input for time or frequency markers . . . Internal calibration source . . . 100% solid state (except CRT) . . . Compact, lightweight and rugged . . . Fully regulated high and low-voltage supplies.

The need for dual-trace scopes has been well-established in industry, engineering, design and service applications. But as the level of technology has increased in electronic products, the demands placed on the dual-trace scope have also increased.

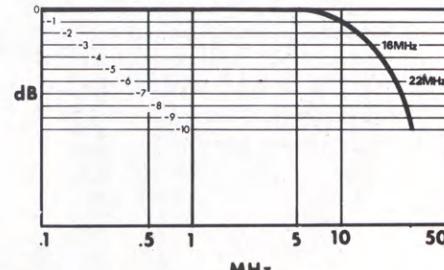
B&K-PRECISION offers the 1472C as an efficient answer to these increased demands. The 1472C's 15MHz frequency response allows it to be used to inspect most digital waveforms with automatic triggering on waveforms having as little as 1cm deflection. And although nominal frequency response extends to 15MHz, the 1472C's smooth rolloff characteristics typically permit usable response through 27MHz—ideal for CB service applications.

Speed and ease of use are increasingly important factors in industrial, design and service equipment. Two of the 1472C's important time-saving features are its automatic selection of CHOPPED or ALTERNATE mode of display and automatic selection of TV line and frame sync, which can

also be used as a low-pass filter for triggering. The trace is automatically chopped at all sweep times of 1mSEC/cm and slower to avoid flickering; at all faster speeds, the sweep is alternated.

The 1472C has a bright P31 blue phosphor CRT with variable graticule scale illumination and includes a tilt stand handle and mylar vector overlay.

FLAT RESPONSE CURVE



FRONT-PANEL VECTORSCOPE AND X-Y OPERATION

The front panel design allows you to switch from conventional operation to Vector-scope or X-Y operation without changing input connections to the scope. Since the matched vertical amplifiers are used for both vertical (CH A) and horizontal (CH B) inputs in this mode, the calibration accuracy of both channels is preserved. The horizontal input signal can therefore be measured in volts/cm of horizontal deflection up to specified frequency response. By using the matched CH A and CH B inputs, phase and amplitude errors due to unequal impedance loading are eliminated. A vector overlay is supplied for vectorscope operation.

The response curve of a scope can have a large effect on its use in certain applications. Because the 1472C's curve is basically ruler-flat until it begins its smooth roll-off (-3dB at 15MHz), there are no inband phase and amplitude errors caused by variations in frequency response. A variation of 1dB is a 10% amplitude difference.

In monitoring and adjusting video processing equipment, where 10% is far beyond tolerable limits, the 1472C's flat in-band response is particularly useful to obtain and maintain consistent picture and color quality. Color cameras, video recorders and network feeds can all be accurately balanced both against each other and against measured standards.

SPECIFICATIONS

VERTICAL AMPLIFIER

Deflection Factor: 10mV/cm to 20V/cm, $\pm 5\%$, in 11 ranges, each with fine adjustment.

Frequency Response: DC, DC—15MHz (-3dB); AC, 2Hz-15MHz (-3dB).

Rise Time: 24nSEC.

Overshoot: 3% or less.

Input Impedance: 1 megohm shunted by 22pF ($\pm 3\text{pF}$).

Non-Distorted Maximum Amplitude: More than 4cm at 15MHz.

Maximum Input Voltage: 300V, DC + AC peak or 600V p-p.

Operating Modes: Channel A only; Channel B only; A & B (dual); A + B; A - B.

Dual Trace—trace automatically chopped at all sweep times of 1mSEC/cm and slower; alternate mode automatically selected for all faster sweep times.

Chop Frequency: 200 KHz $\pm 20\%$.

CH B Polarity: NORM; INV. Selected by mode switch.

Channel Separation: Better than 60dB at 1KHz.

SWEEP SYSTEM (Common to Channel A and Channel B)

Type: Automatic and triggered (NORM)

Sweep Time: 0.5 $\mu\text{s}/\text{cm}$ -0.5 S/cm $\pm 5\%$ in 19 calibrated steps in a 1-2-5 sequence with vernier adjustment.

Sweep Magnification: x5 (five times) $\pm 5\%$. Extends maximum sweep rate to 0.1 $\mu\text{s}/\text{cm}$.

Linearity: 3% or better. 5% or better for 1 $\mu\text{s}/\text{cm}$ and 0.5 $\mu\text{s}/\text{cm}$ ranges.

TRIGGERING

Source: CH A, CH B, and EXT.

Automatic: Sweep is obtained without an input signal.

Normal: Sweep is obtained with a displayed signal amplitude of one cm, or less.

Slope: Sweep can be set to trigger on the positive or negative going slope of the trigger wave form.

TV Sync: Vertical and horizontal sync separator circuitry allows any portion of complex TV video waveform to be synchronized and expanded for viewing. TV-H (line) and TV-V (frame) sync switched automatically by SWEEP TIME/CM switch. TV-V, 0.5SEC/cm to 0.1mSEC/cm. TV-H, 0.05mSEC/cm to 0.5 $\mu\text{SEC}/\text{cm}$.

Low-Pass Filters: The TV sync separator circuits also function as 100Hz-3kHz (TV-V) and 100Hz-1MHz (TV-H) filters.

Coupling: AC, DC, 20Hz-15MHz.

Level: Continuously variable.

Range: 20Hz to 15MHz (min. 1cm deflection on CRT), 20Hz-27MHz typical.

External Trigger Input: 1 V p-p sensitivity.

Maximum Input Voltage: 50 V p-p or 25V DC + AC peak.

Input Impedance: 100K nominal.

Input Capacitance: 35pF (nominal)

HORIZONTAL AMPLIFIER

Input through Channel B vertical input.

Deflection Factor: 10mV/cm, to 20V/cm, $\pm 5\%$, in eleven ranges, each with fine adjustment.

Frequency Response: DC—1 MHz (-3dB).

Input Impedance: 1 megohm (nominal), shunted by 22 pF ($\pm 3\text{pF}$).

Input Protection: 300 VDC + AC peak, or 600V p-p.

X-Y Operation: With SWEEP TIME/CM switch in CH B position, the CH B input becomes the X input (horizontal) and the CH B position control becomes the horizontal position control. Mode (X-Y operation) CH A = Y, CH B = X.

Z-AXIS INPUT (Intensity Modulation)

Sensitivity: 20v p-p minimum.

Usable Frequency Range: DC to 1MHz.

Input Impedance: 470k nominal.

OTHER SPECIFICATIONS

Operating Environment: +5°C to +40°C.

Calibration: Internal 1 V p-p $\pm 5\%$ (square wave at 1kHz $\pm 10\%$).

CRT: 5" with P31 phosphor.

Graticule: Adjustable illumination.

Power Requirements: 117/234 50/60Hz, 23 watt. (Calibration will remain constant over 105 to 130VAC input).

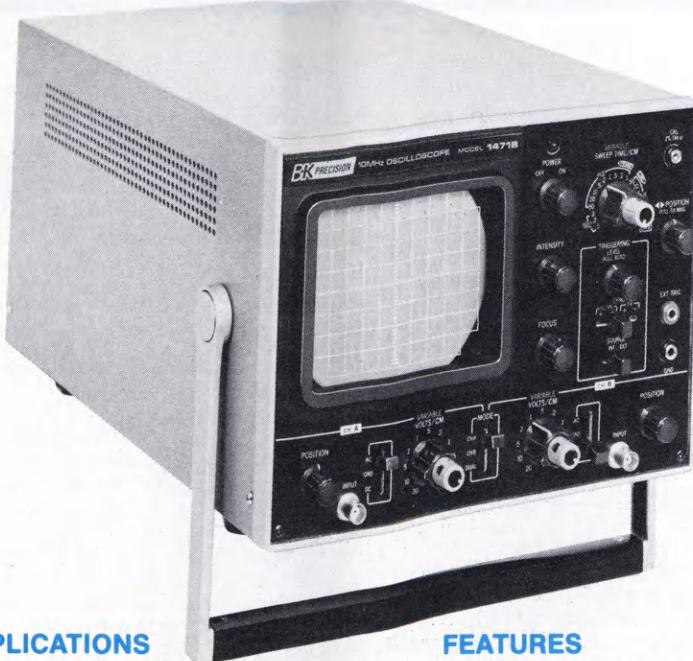
Size without handle: (HWD) 18.4 x 25.3 x 36.9cm (7 $\frac{1}{2}$ x 10 $\frac{1}{2}$ x 14 $\frac{3}{4}$).

Weight: 8.8 kg (19.6 lbs.)

Probes: Two PR-35 10:1/direct probes included. Optional LC-74 protective cover available.

SEE PAGE 4 FOR RACK MOUNTING KIT

Dual-Trace 10 MHz Triggered 5" Scope



MODEL 1471B

- Mode automatically shifts between CHOP and ALTERNATE as you change sweep time for fast set-up
- Bright P31 blue phosphor
- 18 calibrated sweeps—1 μ SEC/cm to .5SEC/cm
- Sweep to 200nSEC/cm with 5X magnification
- Front panel X-Y operation using matched vertical amps
- Input grounding switches
- TV sync separators
- Check most digital logic circuitry including CMOS
- Character display applications using TTL compatible Z-axis intensity modulation
- Includes probes

APPLICATIONS

Display characters directly from TTL drive equipment. Logic and digital design and troubleshooting, including electronic organs, counters, calculators, phase-locked-loops, DMM's and synthesizers...Check the divider networks of any system using TTL, DTL, RTL and most ECL logic...Measure propagation delays and phase shifts...Use built-in TV-V and TV-H sync separator circuits to monitor video...accurately...set sync, video and color burst levels, compare amplifier input/output waveforms.

FEATURES

Usable deflection well beyond 15 MHz...35nSEC rise-time permits accurate display of high-speed square wave pulses...Large 8 x 10cm rectangular viewing area...P31 phosphor...5x magnification for maximum sweep speed of 0.2 μ SEC/cm...Front-panel Vectorscope operation with matched-sensitivity inputs...TTL compatible intensity modulation (Z-axis) input for time or frequency markers and character displays...Internal calibration source...100% solid state (except CRT)...Compact, light-weight and rugged.

B&K-PRECISION offers the 1471B as the most efficient answer to fill the need for a dual trace scope. The 1471B's 10MHz frequency response allows it to be used to examine most digital waveforms with automatic triggering on less than 1 cm deflection. A smooth roll-off in frequency response makes the 1471B usable beyond 15MHz.

Two of the 1471B's important time-saving features are its automatic selection of CHOPPED or ALTERNATE mode for dual-trace display and automatic selection of TV line and frame sync. In dual-trace operation, the trace is automatically chopped at all sweep times of 1mSEC/cm and slower to avoid flickering; at all faster speeds, the sweep is alternated.

SPECIFICATIONS

VERTICAL AMPLIFIER (Channel A and Channel B)

Deflection Factor: 10mV/cm to 20V/cm, $\pm 5\%$ in 11 ranges, each with fine adjustment.

Frequency Response: DC, DC-10MHz (-3dB); AC, 10Hz-10MHz (-3dB).

Rise Time: 35 nS or less.

Overshoot: 3% or less with 100kHz squarewave display.

Input Impedance: 1M ± 22 pF (± 3 pF).

Maximum Input Voltage: 300V DC + AP peak or 600 V p-p.

Operating Modes: CH-A, CH-B, Dual. Dual Trace—trace automatically chopped at all sweep times of 1mSEC/cm and slower, alternate mode automatically selected for all faster sweep times.

Chop Frequency: 200KHz $\pm 20\%$.

CH B Polarity: NORM; INV.

Channel Separation: Better than 60dB.

SWEEP SYSTEM (Common to Channel A and Channel B)

Type: Automatic and triggered (NORM) Mode (X-Y operation) CH A = Y, CH B = X.

Sweep Time: 1 μ S/cm—0.5 S/cm $\pm 3\%$ in 18 calibrated steps in a 1-2-5 sequence with vernier adjustment.

Sweep Magnification: x5 (five times) $\pm 5\%$. Extends maximum sweep rate to 200nS/cm.

Linearity: 3% or better unmagnified. 5% magnified.

HORIZONTAL AMPLIFIER (X-AXIS; Input through Channel B vertical input)

Deflection Factor: 10mV/cm, to 20V/cm, $\pm 5\%$, in eleven ranges, each with fine adjustment.

Frequency Response: DC-1 MHz (-3dB).

Input Impedance: 1 megohm (nominal), shunted by 22 pF (± 3 pF).

Input Protection: 300VDC + AC peak, or 600V p-p.

X-Y Operation: With SWEEP TIME/CM switch in CH B position the CH B input becomes the X input (horizontal) and the CH B position control becomes the horizontal position control.

TRIGGERING

Source: INT and EXT, Internal; CH A and CH B. In dual-trace operation, internal trigger is supplied by Channel A.

Automatic: Sweep is obtained without an input signal.

Normal: Sweep is not obtained without an adequate trigger signal.

Slope: Sweep can be set to trigger on the positive or negative going slope of the trigger waveform.

TV Sync: Vertical and horizontal sync separator circuitry allows any portion of complex TV video waveform to be synchronized and expanded for viewing. TV-H (line) and TV-V (frame) sync switched automatically by SWEEP TIME/CM

switch. TV-V, 0.5SEC/cm to 0.1mSEC/c. TV-H, 50 μ SEC/cm to 1 μ SEC/cm.

Level: Continuously variable, selecting minimum trigger amplitude.

Range: 20Hz to 10MHz (min. 1cm deflection), 20Hz-15MHz typical.

EXTERNAL TRIGGER INPUT

Maximum Input Voltage: 50V P-P or 25V DC+ AC Peak.

Input Impedance: 100K nominal.

Input Capacitance: 35pF (nominal).

Z-AXIS INPUT (Intensity Modulation)

Sensitivity: 5v TTL compatible.

Usable Frequency Range: DC to 5MHz.

Input Impedance: 470k (nominal).

OTHER SPECIFICATIONS

Operating Environment: -0°C to +45°C.

Calibration: Internal 1 V p-p $\pm 5\%$ (square wave at line frequency).

CRT: 5" with P31 phosphor.

Power Requirements: 117/234 50/60Hz, 20 watt. (Calibration will remain constant over 105 to 130VAC input). CSA approved.

Size without handle: (HWD) 18.4 x 25.3 x 36.9cm (7/4 x 10 x 14-3/4").

Weight: 8.8 kg (19.6 lbs).

Probes: Two PR-31 10:1/direct probes included. Optional LC-74 protective cover available.

10MHz Triggered Sweep 5" Oscilloscope



MODEL
1461

- 18 sweep range selections
- 10mV/cm sensitivity
- Fully regulated...calibration is accurate from 105-130 V line.
- Automatic selection of horizontal or vertical TV signals
- Built-in calibration signal
- Triggered and automatic sweep
- Built-in TV vertical and horizontal sync separation circuits
- TTL compatible Z-axis input
- Includes probe

This is one scope that's equally at home in an R&D lab or on a technician's bench. Top styling and performance form a blend uncommon in this price category.

The Model 1461 offers all the advantages of triggered sweep with automatic sync plus very high 10mV/cm sensitivity. The eleven-position vertical attenuator is conveniently calibrated in 1/2/5 step sequence.

Vertical and horizontal sync separation circuits are built-in, allowing you to synchronize and expand any portion of a complex TV waveform. TVH (line) and TVV (frame) sync are switched automatically by the SWEEP TIME/CM switch. TV sync polarity is selected by an independent SYNC switch. Other time saving special features include built-in vectorscope capability, automatic triggering, and an internal 1Vp-p calibration source.

Extremely flat vertical amplifier response assures you of no unforeseen dips or peaks in bandwidth. Response is typically down only 6dB (or less) at 14MHz. Triggering capability extends far beyond that frequency.

FEATURES

Ultra-fast writing speeds of up to $.2\mu\text{SEC}/\text{cm}$ (with 5x magnification). Syncs waveform displays with amplitudes as low as 1cm p-p...DC amplifier for measurement of AC and DC signal components...Exclusive B&K-PRECISION circuit regulates high voltage on accelerating anode for sharp, bright patterns even at fastest writing speeds...100% solid state circuitry...Front-panel Vectorscope capability...Exclusive sync separator locks sweep for jitter-free TV waveform displays...Fully regulated supply voltages—calibration applies over full input voltage range...P31 phosphor.

SEE PAGES 46-47 FOR PROBE INFORMATION

APPLICATIONS

General purpose design engineering...Medium speed logic design work...Display smallest transistor and IC signal levels with positive sync...Display "back porch" of horizontal sync with color burst information, automatically synchronized...Lock in and expand Vertical Interval Test Signal (VITS) for viewing...Accurately reproduce high frequency (3.58 MHz) color burst...Display and expand any portion of a complex TV waveform.

SPECIFICATIONS

VERTICAL AMPLIFIER

Deflection Factor: 10mV/cm to 20V/cm, $\pm 5\%$ in 11 ranges, each with fine adjustment.

Frequency Response: DC, DC-10MHz (-3dB); AC, 2Hz-10MHz (-3dB).

Rise Time: 35 nS or less.

Overshoot: 3% or less with 100kHz squarewave display.

Input Impedance: $1\text{M} \pm 5\%$, 22 pF ($\pm 3\text{ pF}$).

Tilt: less than 5%.

Maximum Input Voltage: 300V DC + AC peak or 600 V p-p.

SWEEP SYSTEM

Type: Automatic and triggered (NORM) Mode

Sweep Time: $1\text{ }\mu\text{S}/\text{cm}$ — $0.5\text{ S}/\text{cm} \pm 5\%$ in 18 calibrated steps in a 1-2-5 sequence with vernier adjustment.

Sweep Magnification: x5 (five times) $\pm 5\%$. Extends maximum sweep rate to 200 nS/cm.

Linearity: 3% or better; 5% with 5x magnification.

HORIZONTAL AMPLIFIER

Deflection Factor: 10mV/cm, to 20V/cm, $\pm 5\%$, in eleven ranges, with fine adjustment.

Frequency Response: DC-1 MHz (-3dB).

Input Impedance: 1 megohm (nominal), shunted by 22 pF ($\pm 3\text{ pF}$).

Input Protection: 300 VDC + AC peak, or 600 V p-p.

TRIGGERING

Source: INT AND EXT.

Automatic: Sweep is obtained without an input signal.

Normal: Sweep is obtained with displayed signal amplitude of one cm or less.

Slope: Sweep can be set to trigger on the positive or negative going slope of the trigger waveform.

TV Sync: Vertical and horizontal sync separator circuitry allows any portion of complex TV video waveform to be synchronized and expanded for viewing. TV-H (line) and TV-V (frame) sync switched automatically by SWEEP TIME/CM switch. TV-V, 0.5SEC/cm to 0.1mSEC/cm. TV-H, $50\text{ }\mu\text{SEC}/\text{cm}$ to $1\text{ }\mu\text{SEC}/\text{cm}$.

Low-Pass Filters: The TV sync separator circuits also function as 100Hz-3kHz (TV-V) and 100Hz-1MHz (TV-H) filters.

Level: Continuously variable, selecting minimum trigger amplitude.

Range: 20Hz to 10MHz (min. 1cm deflection), 20Hz-15MHz typical.

EXTERNAL TRIGGER INPUT

Maximum Input Voltage: 50V P-P or 25V DC + AC Peak.

Input Impedance: 100K nominal.

Input Capacitance: 35pF (nominal).

Z-AXIS INPUT (Intensity Modulation)

Sensitivity: 5v TTL compatible.

Usable Frequency Range: DC to 5MHz.

Input Impedance: 470k (nominal).

OTHER SPECIFICATIONS

Operating Environment: 0°C to $+45^\circ\text{C}$.

Calibration: Internal 1 V p-p $\pm 5\%$ (line frequency square wave).

CRT: 5" with P31 phosphor.

Power Requirements: 117/234 50/60Hz, 20 watt. (Calibration will remain constant over 105 to 130VAC input). CSA approved for oscilloscopes.

Size without handle: (HWD) 18.4 x 25.3 x 36.9cm (7-3/8 x 10-1/3 x 14-3/4").

Weight: 8 kg (17.3 lbs.)

Probe: PR-31 10:1/direct probe included.

Optional LC-74 protective cover available.

SEE PAGE 4 FOR RACK MOUNTING KIT

5MHz Solid State 3" Oscilloscope



Take it with you!
Weighs just
8.5 pounds!

The 1403A is compact enough to take anywhere—just 6" x 7.5" x 12" deep! And its sturdy integral handle makes it easy to carry safely.

For optional LC-14 protective carrying case and accessory probes, see pages 45-47.

The 1403A is an outstanding value. Bandwidth extends to 5 MHz with a sensitivity of 10 mV/div or better. With high brightness CRT and smoked-glass filter, waveforms are clear and, easy to observe. The graticule features conventional division indexing plus a dB reference scale.

The 1403A is ideal for many monitoring applications, freeing more expensive scopes from "menial" monitoring tasks. Just set the controls for the waveform being monitored and leave the rest to your tester. She'll appreciate the 1403A's sharp trace and stability.

The 1403A takes up very little space on production line, classroom lab table or bench. Bright display, its sturdy construction, and portability make it ideal for use anywhere—even field service. This rugged scope has DC amplifiers on both vertical and horizontal axes and direct-deflection terminals for waveforms up to 450MHz!

A Z-axis input terminal is also provided for intensity modulation. When a positive signal is supplied to this terminal, the waveform intensity is increased. A negative signal decreases intensity.

MODEL 1403A

- 5 MHz with high sensitivity
- For production lines, schools, field service work, hobbyists
- CB modulation monitor
- Ultra-compact and lightweight; goes anywhere!
- Use the 1403A to release more expensive scopes from monitoring applications
- Vertical sensitivity of 10mV/division.
- High brightness CRT and smoked-glass graticule
- Can be externally synced
- Direct deflection terminals for waveform display up to 450MHz
- Z-axis input for intensity modulation

The 1403A is completely solid state (except CRT), weighs just 8.5 pounds, has a three-wire grounded AC cord, and comes with test leads.

The PR-21 isolation/direct probe is designed for use with the 1403A. It prevents capacitive loading and RF interference when measuring DC in RF circuits and has a switchable 100 K isolating resistor. All other B & K-PRECISION probes can also be used when a UHF-to-double banana or BNC-to-double banana connector adapter is employed. Probes are optional.

SPECIFICATIONS

VERTICAL AMPLIFIER

Deflection Factor: 10mV/division or better.
Response: DC, DC-5MHz (-3dB); AC, 2Hz-5MHz (-3dB). (Direct deflection terminals allow waveform display to 450MHz at reduced sensitivity.)
Overshoot: 5% or less.
Maximum Input Voltage: 300V (DC + AC peak) or 600V p-p.
Input Impedance: 1 meg shunted by 35pF.
Attenuator: 1, 1/10, 1/100 multiplier, ±5%.
Gain Control Range: Continuously variable range greater than 22dB.

HORIZONTAL AMPLIFIER

Deflection Factor: 300mV/division or better.
Response: DC-250kHz.
Input Impedance: 1 meg shunted by 30pF.
Rated maximum input voltage: 100V p-p.
SWEEP SYSTEM
Type: Recurrent. Time Base Ranges: 10-100Hz, 100-1000Hz, 1-110kHz; continuously variable between ranges. Sweep Linearity: ±5%.
Synchronization: Internal, negative, external.
Signal Required for Sync: (Internal) More than 1 DIV. deflection on CRT. (External) More than 2 Vp-p.

Direct Deflection Terminals: 10V/division sensitivity or better; 2.2M shunted by 25 pf (or less) input impedance.

GENERAL

Intensity Modulation: 25V peak-to-peak.
Power Requirements: 117/234VAC, 50-60Hz, 16W; three-wire grounded line cord.
Accessories Included: Leads, spare fuse, instructions.
Optional: LC-14 Case.
Size: (HWD) 15 x 19 x 30cm (6 x 7.5 x 12")
Weight: 3.8 kg. (8.5 lbs.)

520 MHz Frequency Counter



FEATURES TIME-BASE STABILITY 1 PPM 0-50C

MODEL

1850

- 5Hz to 520 MHz reading guaranteed —600 MHz typical
- Gate time from 10ms to 10 seconds
- Full period measurement capability
- 50 mV input sensitivity at 520MHz
- Operates from 115 or 230 VAC, or 12 VDC
- Well protected input circuitry
- Temperature compensated crystal oscillator (TCXO)

APPLICATIONS

RF frequency measurement to 520MHz, including business band, broadcast service, amateur radio, marine band, paging

systems, mobile telephones and citizens band...Communications design engineering . . . Calibrate tone activated control systems . . . Instrumentation time-base frequency calibration, including micro processor systems . . . Accurately adjust CATV system modulator frequencies . . . Low-frequency measurements in period mode to 5Hz with 1Hz resolution.

FEATURES

TCXO time base...Internal time base output on rear panel...Period measurement from 5Hz to 1MHz...Leading zero suppression . . . Handle/tilt stand adjusts to four viewing angles or folds behind the case... Bright .43" tall LED readout...No warm-up time required . . . Covers all major land mobile bands including the new "T" band.

SPECIFICATIONS

FREQUENCY CHARACTERISTICS

RANGE: Normal: 5 Hz to 60 MHz; Function switch selects kHz or AUTO display reading. **Prescale:** 10 MHz to 520 MHz; Function switch selects kHz or AUTO display reading. **GATE TIME AUTO:** Normal: 10ms (MHz reading), 100ms and 1 sec. (kHz reading). **Prescale:** 10ms and 100ms (MHz reading), 10 sec (kHz reading). **GATE TIME MANUAL:** Normal: 1sec. (kHz reading—1 Hz resolution). **Prescale:** 10 sec (kHz reading 1 Hz resolution). **Accuracy:** ±time base accuracy ±1 count. **Resolution:** The total uncertainty in frequency determination is ±0.0001% (i.e. 1 PPM of a 6 digit scale) on all ranges. **Input:** Front panel connectors (normal & prescale). **Display:** Frequency of input signal with automatically positioned decimal point. Units of measurement (kHz, MHz) displayed on front panel with illuminated indicator.

PERIOD CHARACTERISTICS

(Normal input only)

Range: 5 Hz to 1 MHz; Function switch selects μs (100 period average) or AUTO display reading. **Period Average Auto:** 1 period average (ms), 10 and 100 period average (μs). **Period Average Manual:** 100 period average (μs reading with

1 ns resolution). **Internal Frequency Counted:** 10 MHz. **Period Pulse Width:** 200ns or longer required for period measurement. **Accuracy:** Trigger uncertainty ± time base accuracy: Periods averaged ± 1 LSD. **Input:** Front Panel Connector (normal). **Display:** Period of input signal with automatically positioned decimal point. Units of measurement (ms, μs) displayed on front panel with indicator. **Overrange:** In period mode the overrange indicator will flash.

INPUT CHARACTERISTICS

IMPEDANCE: Normal: 1 Megohm resistance shunted by 25 pf capacitance. **Prescale:** 50Ω with less than 2V RMS input. **Connectors:** BNC. **Coupling:** AC.

SINEWAVE SENSITIVITY

(Measured on AC supply, 6 db sensitivity degradation allowed on automotive battery power). **Normal:** 30mV, 5 Hz to 40 MHz; 50mV maximum at 60 MHz (5 Hz to 1 MHz in period) measured with a signal generator terminated in its characteristic impedance. **Prescale:** 50mV RMS, 10 MHz to 520 MHz with 50Ω.

MAXIMUM INPUT

Normal: 200V (peak ac + dc) DC to 500 Hz,

For engineers and technicians requiring accurate frequency measurement extending into the UHF range, the new Model 1850 will seem "made to order." The prescaled range covers 10 to 520 MHz while the normal range is from 5Hz to 60MHz. Autoranging is featured on both normal and prescaled ranges. Gate times from 10ms to 10 seconds are automatically selected in the prescale mode, and 10ms to 1 second in the normal range. For manual gate time selection, 1 second operation in normal and 10 seconds in prescale are selectable.

The 1850 allows you to easily meet FCC standards when making frequency adjustments on land mobile, radio telephone and citizens-band transmitters. Because the 1850 extends to 520MHz, it even covers the new UHF "T" band. Sensitivity at 520MHz is 50mV.

A high-accuracy TCXO (temperature compensated crystal oscillator) time base is standard. Temperature stability is better than ±1 PPM from 0 to 50°C and the maximum aging rate is ±1 PPM per year. Warm-up time is non-existent. All this means that the 1850 will retain its accuracy under virtually all operating conditions, for a very long time period.

For accurate very low-frequency measurements, the 1850 has period measurement capability. Period frequency range covers 5 Hz to 1 MHz, with selectable 100 period average or AUTO display reading. In auto, a period average of a 1, 10 or 100 period average is selected. In PERIOD, as in other modes, decimal-point position and unit of measure display is automatic.

FOR OPTIONAL PR-37 DELUXE PROBE, SEE PAGE

Derate linearly to 100V (peak ac + dc) at 1 KHz. 100 (peak ac + dc) 1 kHz to 5 MHz, Derate linearly to 30V (peak ac + dc) at 60 MHz. (C) **Prescale:** 5V RMS, 10 MHz to 520 MHz. (B)

INTERNAL TIME BASE CHARACTERISTICS (Referenced to 25°C)

Type: TCXO (Temperature Compensated Crystal Oscillator). **Frequency:** 10 MHz. **Setability:** ±0.1 PPM (±1 Hz). **Temperature Stability:** ±1 PPM maximum 0°C to 50°C ambient. **Maximum Aging Rate:** ±1 PPM/year. **Internal Time Base Output:** 10MHz TTL Level (rear panel BNC jack).

DISPLAY CHARACTERISTICS

Visual Display: 6 digits .43" high with overflow kHz/μs, MHz/ms indicator and leading zero blanking. **Overflow Indication:** Flashing light indicates counter frequency range is exceeded. **Display Time:** Fixed; 200ms plus gate interval.

GENERAL

Power Requirements: 105 to 130V, and 212 to 258V, 50/60 Hz with internal transformer jumpers. 11 to 16VDC Automotive battery with accessory power cable (provided with unit). **Size (HWD):** 8.1 x 29 x 19 cm (3.25 x 11.6 x 7.50") including handle at rest position. **Weight:** 2.55 Kg (5 lbs.).

80MHz Counter with Period Function



MODEL

1820

- 5Hz to 80MHz reading guaranteed—100MHz typical
- Period measurements from 5Hz to 1MHz.
- Period average, auto and manual positions
- One PPM resolution
- Totalizes to 999999 plus overflow
- Elapsed time measurements from .01 to 9999.99 seconds plus overflow
- One-megohm input resistance
- Bright .43" high LED readouts

APPLICATIONS

Touch-tone* pad calibration...Accurate PL frequency adjustments...Production line

testing and alignment...Elapsed time measurements with remote trigger or front panel control...Oscillator frequency adjustments...Precise multiplex and SCA pilot carrier adjustments...Measure power generator output frequencies...Measure audio tape deck and turntable speeds...Calibrate ultra-sonic alarm and control systems...Set tone-burst generator period and frequency.

FEATURES

Accepts external time base...Remote start/stop operation of elapsed time...50mV sensitivity at 80MHz, 30mV 5Hz-40MHz...x10 input attenuator...One PPM resolution on all ranges...Versatile tilt-stand/handle adjusts to four viewing angles or folds behind cabinet...Anti-glare viewing window...Accurate readout with period mode to 1Hz, even when measuring a 5Hz signal

...200 volt DC to 500Hz input protection...Leading zero blanking...Operates on 105 to 130VAC or 212 to 258VAC 50/60Hz with internal jumpers.

The new B&K-PRECISION Model 1820 Universal Frequency Counter is truly a user oriented instrument. Push buttons allow rapid selection of all modes. For frequency measurements, the 1820 reads to a typical top frequency of 100MHz and reads signals as low as 5Hz. By using the period mode, accurate resolution of the 5Hz signal is to 1ns (.00000001Hz). The 1820 is fully autoranging, with automatic decimal point position and MHz/ kHz readout.

In the accumulate mode, "event counts" are displayed by totalizing pulses counted, up to 999.99. A touch of the RESET button restores the count to zero. This mode is useful in counting the number of operations performed by production machines or in quality control tests. For elapsed time measurements, select the TIME mode. The 1820 counts from .01 to 9999.99 seconds (2.777 hours) plus overrange. Because the TIME mode can be remotely started and stopped by a triggering pulse, it is ideal for such industrial applications as time measurement of solenoid activation and the end of a duty cycle, when a servomotor shuts down.

For period measurements, the 1820 will resolve to 1 nanosecond. The function switch selects μ s (100 period average) or auto display reading. In addition to interval timing the PERIOD mode allows low-frequency measurements to be made with high accuracy.

*Registered trademark of Western Electric

SEE PAGE 47 FOR OPTIONAL PR-37
DELUXE PROBE

SPECIFICATIONS

FREQUENCY CHARACTERISTICS

Range: 5Hz to 80MHz; Function switch selects kHz or AUTO display reading. Gate Time Auto: 10ms (MHz reading) and 100ms and 1 sec. (kHz reading). Gate Time Manual: 1 sec. (kHz reading—1Hz resolution). **Accuracy:** \pm time base accuracy \pm 1 count. **Resolution:** The total uncertainty in frequency determination is $\pm 0.0001\%$ (i.e. 1 PPM of a 6 digit scale) on all ranges. **Display:** Frequency of input signal with automatically positioned decimal point. Units of measurement: (kHz, MHz) displayed on front panel with illuminated indicator.

PERIOD CHARACTERISTICS

Range: 5Hz to 1MHz; Function switch selects μ s (100 period average) or AUTO display reading. Period Average Auto: 1 period average (ms), 10 and 100 period average (μ s). Period Average Manual: 100 period average (μ s reading with 1ns resolution). **Internal Frequency Counted:** 10MHz. **Period Pulse Width:** 200 ns or longer required for period measurement. **Accuracy:** Trigger uncertainty periods averaged \pm Time Base Accuracy, ± 1 LSD. **Display:** Period of input signal with automatically positioned decimal point. Units of

measurements: (ms, μ s) displayed on front panel with indicator. Overrange: in period mode the overrange indicator will flash.

TOTALIZE CHARACTERISTICS

Range: 5Hz to 80MHz. **Capacity:** 0 to 999999 plus overflow. **Control:** Manual reset to 0, provision for user conversion to remote reset.

ELAPSED TIME

Range: .01 to 9999.99 sec. (166.66 minutes or 2.77 hours) plus overrange. **Display:** Positioned decimal point. **Accuracy:** \pm time base accuracy \pm trigger error \pm 1 count. **Trigger Input:** Rear panel connector. TTL or contact closure compatible. (i.e. a low to high or open circuit starts time and a high to low or closed circuit stops timer). **Reset:** Manual operation on front panel.

INPUT CHARACTERISTICS

Impedance: 1 Megohm resistance shunted by 25 pF capacitance. **Coupling:** AC. **Sinewave Sensitivity:** 30mV rms, 5Hz to 40MHz; 50 mV maximum at 80MHz measured with a signal generator terminated in its characteristic impedance. **Maximum Input:** 200V (peak AC +DC) DC to 500Hz, derate linearly to 100V at 1KHz. 100V

(peak AC + DC) 1KHz to 5MHz, derate linearly to 30 V (peak ac + dc) at 80MHz. **Attenuator:** X10 switch selectable.

INTERNAL TIME BASE CHARACTERISTICS

(Referenced to 25°C after 1/2 hour warm-up)
Type: Crystal Oscillator. **Frequency:** 10MHz. **Setability:** ± 1 PPM (± 1 Hz). **Line Voltage Stability:** Less than ± 1 PPM for $\pm 10\%$ Line Voltage Variation. **Temperature Stability:** Less than $\pm 0.001\%$ (i.e. ± 10 PPM) from 0°C to 50°C ambient. **Maximum Aging Rate:** ± 10 PPM/YR (± 1 PPM/MO). **External Input:** TTL Level, 5V to 2.5V P-P, switch selectable.

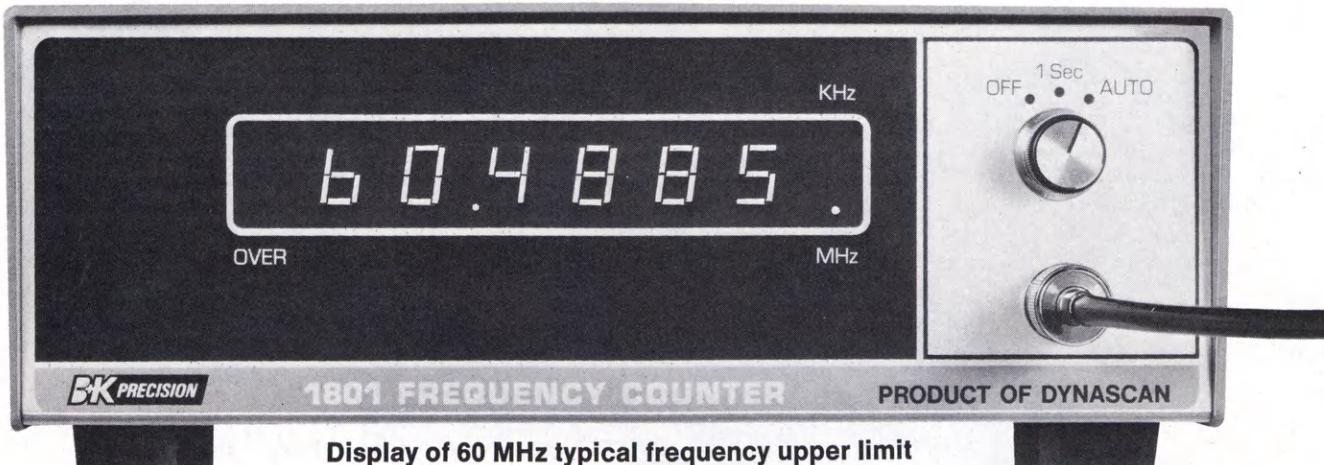
DISPLAY CHARACTERISTICS

Visual Display: 6 digits .43" high with overflow, kHz/ μ s, MHz/ms indicator, and leading zero blanking. **Overflow Indication:** Flashing light indicates counter frequency range is exceeded. **Display Time:** Fixed, 200ms plus gate interval.

GENERAL

Power Requirements: 105V to 130V and 212 to 258V, 50/60 Hz with internal transformer jumpers. **Size (HWD):** 8.1 x 29 x 19cm. (3.25 x 11.6 x 7.50") at rest position. **Weight:** 2.55 kg (5 lbs.).

40MHz Autoranging Counter



Display of 60 MHz typical frequency upper limit

MODEL 1801

- Automatic ranging 20Hz-40MHz guaranteed
- 10Hz-60MHz typical
- 1H resolution
- New larger, brighter display
- Reliable discrete TTL logic

For many years, frequency counters were expensive, hard to use laboratory equipment. But now B&K-PRECISION makes it possible to enjoy digital frequency counting accuracy for far less than the cost of most counters—without sacrificing ruggedness, sensitivity, or quality. Reliable, discrete TTL circuitry automatically updates the six-digit solid-state readout up to five times per second.

Set the Function switch to AUTO and the 1801 automatically fills all display positions, suppressing the least significant digits if necessary and indicating the range in kHz or MHz (see Fig. 1, typical AM IF, and Fig 2, typical CB channel, at right). Resolution to 1Hz is available in 1 SEC mode; the readout is displayed in kHz. In this position, MHz inputs will overflow the six-digit display, causing a red LED OVERRANGE indicator to blink. Switching back to AUTO mode

restores the missing significant digits at the expense of the least significant digits (see Fig. 4, TV color carrier frequency overflowing in 1 SEC mode, and Fig. 3 same input in AUTO mode). The 1801 is also compatible with all commercially available prescalers to extend the frequency range into the UHF range (100:1 prescaling).

APPLICATIONS

Fast, precision oscillator tuning . . . TV broadcast stations, adjusting CB and other radio communications receivers and transmitters . . . Align ultra-sonic controls and alarms . . . High-speed reading for production tests . . . Precision audio frequency analysis . . . Frequency monitor . . . Minimum controls for ideal classroom or production line use . . . Requires less than 25 watts for field use.

FEATURES

Suppression of leading digit for extra resolution above 1 MHz on 1 SEC gate time . . . 10MHz crystal time base for stability . . . User-convertible to external time base . . . Three automatic decimal point positions . . . Accepts wide input range with no level adjustment normally needed . . . Autoranging 20Hz-40MHz (typically 10Hz-60MHz, but may require larger input signal) . . . 10, 100 or 1000mSEC gate times automatically selected for best accuracy and fastest reading . . . One simple trimmer for time base adjustment (when needed)

SPECIFICATIONS

FREQUENCY—Range: 20Hz-40MHz guaranteed; 10Hz to over 60 MHz typical.

Auto Gate Time: 10mSEC or 100mSEC (MHz reading) or 1SEC (kHz reading), chosen automatically. **Manual Gate Time:** 1SEC (kHz reading, 1Hz resolution). **Accuracy:** \pm time base accuracy, ± 1 count. **Resolution:** 1Hz. **Display:** Input signal frequency, automatically positioned decimal point. Units (kHz, MHz) displayed on front panel by illuminated indicator.

INPUT CHARACTERISTICS—Impedance: 1meg/25pF. **Protection:** Diode. **Connector:** Front panel BNC. **Coupling:** AC. **Sine Wave Sensitivity:** 30mV RMS (guaranteed); 15mV RMS (typical); 20Hz-40MHz. **Max. Input (peak AC + DC):** 200V to 500Hz; linearly derated to 100V at 1kHz; 100V, 1kHz-5MHz; linearly derated to 50V at 40MHz.

INTERNAL TIME BASE CHARACTERISTICS (Ref. 25°C after 30 min. warmup).—**Type:** Xtal oscillator. **Frequency:** 10MHz. **Setability:** ± 0.1 PPM (± 1 Hz). **Line Voltage Stability:** Better than 1PPM for $\pm 10\%$ line variation.



Fig. 1
kHz display of AM IF (AUTO mode)



Fig. 2
MHz display of CB channel (AUTO mode)



Fig. 3
MHz display of 3.579545MHz input (AUTO mode)



Fig. 4
kHz display of overflow of 3.579548MHz color carrier input (1SEC mode)

MODEL PR-25 PROBE (Optional)

10:1 and 1:1 compensated counter probe (optional)
Model 1801 can also be used with deluxe 10:1 and 1:1 probe Model PR-37 (see page 47).

Temperature Stability: Better than $\pm 0.001\%$ (i.e., ± 10 PPM), 0-50°C. **Max. Aging Rate:** 10PPM/year, 1PPM/month.

DISPLAY CHARACTERISTICS—Visual: 6 digits with overflow, kHz and MHz indicators. **Overflow:** Flashing light. **Display Refresh Interval:** Fixed; 200mSEC plus gate interval.

GENERAL—Power Requirements: 105-130V, 60Hz; 210-260V, 50/60Hz, 25W max. CSA approved. **Size (HWD):** 8.3 x 22 x 26cm (3.3 x 8.69 x 10.5"). **Weight:** 2.5kg. (5.5 lbs.). **Handle:** Combination "kickstand" and handle attached to bottom of unit.

New 30MHz Portable Frequency Counter

MODEL 1827



- 30MHz reading guaranteed, 50MHz typical
- Full 6-digit display with range switch allows 8-digit accuracy
- 1Hz resolution—even at 30MHz and beyond
- Ideal for field service and MRO applications
- Completely portable for use anywhere
- Exclusive battery saver features auto-shutoff of display to reduce battery drain
- Operates on AA size batteries, AC with optional charger/adapter or 12VDC with optional power cord/adapter
- Complete range of optional accessories for unequalled versatility
- Easy to use...fully autoranging

APPLICATIONS

Field service applications...Transmitter or receiver alignment...Engineering applications...Schools...MRO applications...Alignment of depth sounders and fish spotters...Alignment of ultrasonic remote control system...Measure output frequency of CB or ham transmitters and transceivers, mobile or base...Measure audio generator frequencies for stereo system evaluation...Set output frequencies of experimental projects.

The B&K-PRECISION Model 1827 combines true versatility with a very low price. Not much larger than a pocket calculator, the 1827 offers such features as full six-digit display and guaranteed operation to 30MHz with 1Hz resolution.

The low cost of the B&K-PRECISION 1827 means that a laboratory or shop that couldn't afford a frequency counter for

each bench can now do so. Because the 1827 is so compact and portable, it's ideal for field service. Even the occasional user will find that the 1827 is very affordable and could rapidly pay for itself.

Full autoranging provides direct frequency readout of the six most significant digits, or switch to the "1 second" position for 1Hz resolution. Decimal point position and MHz/kHz indication are both automatic to help eliminate reading errors.

An exclusive battery saver feature electronically shuts off power to the LED display after 10 seconds of operation. A touch of the DISPLAY button instantly restores the display for another 10 seconds. In normal use, the 1827 operates for more than 8 hours on six ordinary rechargeable AA batteries (batteries optional). When operated by an external power source, DC or AC, the display re-

mains on continuously. The 1827 can be powered from either an external 6.7 to 9.7 volts, 12 volts DC (for mobile operation) or 115VAC with appropriate accessories.

State-of-the-art design and exclusive LSI integrated circuit allow an incredible amount of circuitry to be packed into a compact case. For strength and reliability, glass epoxy and fiber glass reinforced circuit boards are used throughout the 1827.

The sensitive input preamplifier section is fully shielded and protected against input overloads up to 200 volts peak AC + DC. By taking full advantage of the latest integrated circuit technology and B&K-PRECISION's expertise in cost-effective instrument design, the 1827 has been built to outperform frequency counters costing more than twice its price.

*Typical usable range

SPECIFICATIONS

FREQUENCY CHARACTERISTICS

Range: 100Hz to 30MHz (guaranteed); 50MHz typical. Function switch selects kHz or AUTO display reading. **Gate Time:** (Auto) 10mSEC or 100mSEC (MHz reading), or 1 SEC (kHz reading), chosen automatically (Manual) 1 SEC (kHz reading, 1Hz resolution). **Accuracy:** ± 1 count. **Resolution:** 1 PPM of a 6 digit scale.

INPUT CHARACTERISTICS

Impedance: 10 k Ω minimum. **Connector:** RCA Phono. **Sinewave Sensitivity:** 100mV RMS; 200kHz—30MHz. 200mV RMS; 100Hz—200kHz. **Maximum Input:** 200V (peak AC + DC) to 500Hz;

derated linearly to 100V at 1kHz; and 25V at 30MHz.

TIME BASE CHARACTERISTICS (25° C.)

Frequency and Type: 4.0MHz crystal oscillator. **Setability:** ± 0.25 PPM (± 1 Hz). **Temperature Stability:** Better than $\pm 0.001\%$ (i.e. ± 10 PPM) from 0-50°C ambient. Referenced to 25°C. **Maximum Aging Rate:** 10 PPM/Year, 1/PPM Month.

DISPLAY CHARACTERISTICS

Visual Display: Six .3" high LED digits with overflow, LED kHz and MHz indicators and anti-glare window. **Display:** Frequency of input signal with automatically positioned decimal point."kHz," "MHz" displayed in front panel by illuminated indicator. **Overflow Indication:** Flashing LED. **Display Refresh Interval:** 200 mSEC plus gate interval.

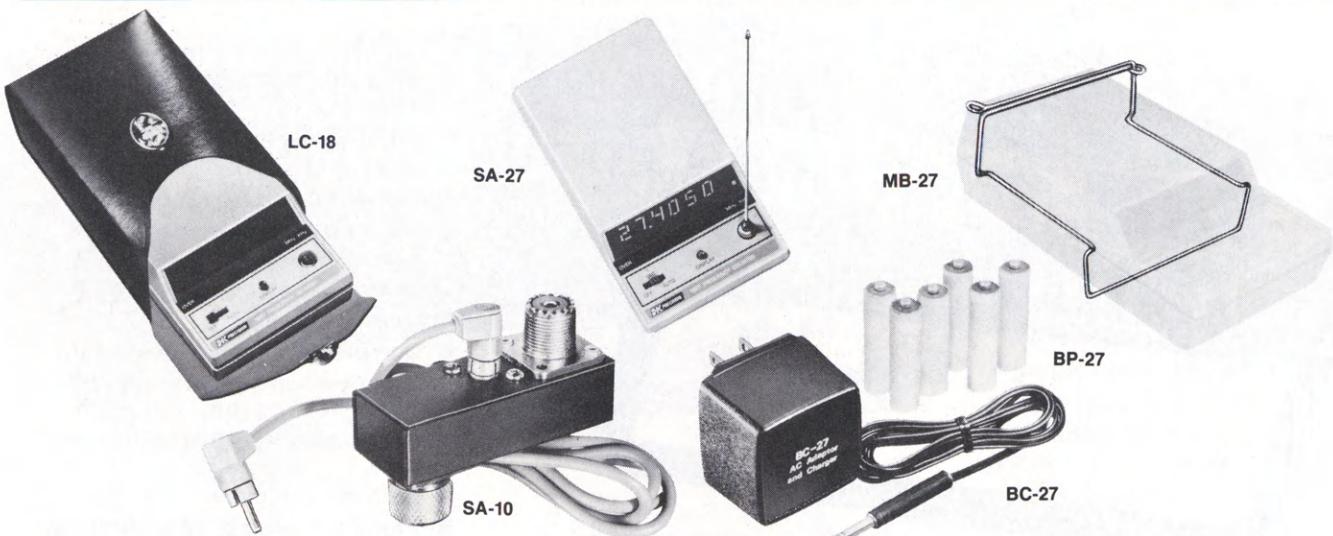
Battery Saver: Display is blanked (decimal point remains lit) in battery operation until the DISPLAY button is pushed. The display will remain on as long as the button is depressed and for an additional 10 seconds after released. Display will stay on continuously with external power.

GENERAL

Power Requirements: 6 to 9V ("AA battery operation) or 6.7 to 9.7VDC at external power jack input. **Battery Life:** Eight hours minimum for normal usage pattern. **Battery Charging Time:** 14-16 hours required for full charge. Batteries are not required when operated on external power. **Size (HWD):** 4 x 9.5 x 17cm (1.75 x 3.75 x 6.6"). **Weight:** Less than 0.45kg (1 lb.) with batteries.

Model CC-51 clip lead input cable included.

... 1Hz resolution—even at 50MHz*



A full range of optional accessories makes the B&K-PRECISION 1827 even more versatile!

Cable CC-52 allows operation on an external 6.7 to 9.7 volts DC. (not shown)

Model BP-27 Your 1827 will operate for more than eight hours of normal use with the BP-27 rechargeable battery pack.

Model BC-27 charger also functions as an AC adapter for base station or lab use, with or without batteries in the 1827.

Model SA-10 To monitor the output frequency of your mobile or base CB or ham radio, use the SA-10 signal tap with the 1827. Rated at 100 watts.

Model LC-18 Perfect for carrying the 1827 in field service or storage. This quality case has a black leatherette finish and a rugged snap fastener.

Model MB-27 Allows you to mount the 1827 under a shelf, dash board or transceiver. The 1827 can be easily slid in or out of the MB-27 without loosening a screw, yet is held firmly in place while mounted.

Model SA-27 For use with walkie-talkies and other portable transceivers, the SA-27 pick-up antenna adapts the 1827 for "wireless" frequency measurement of nearby portable transmitters.

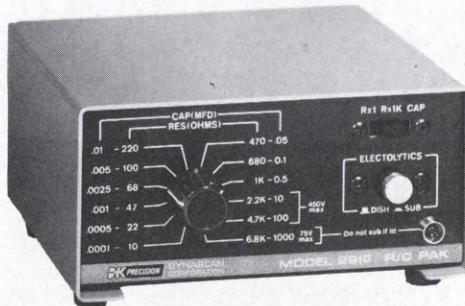
New Surge Protected Substitution Box

How B&K-PRECISION'S New Surge Protector Works...

A charging surge can temporarily heal a defective electrolytic, masking the problem and resulting in call-backs and extra service time. The surge protector circuit in the 2910 prevents this by automatically putting a resistor in series with the capacitor to limit initial surge. After the capacitor is fully

charged, the lockable switch is moved to the SUB position, which takes the resistor out of the circuit. After substitution, the switch is spring-returned to the DISCH position, ensuring safe RC discharge of the sub capacitor. This eliminates any shock hazard and prevents the accidental and dangerous

discharge of the sub into a low-voltage circuit the next time it is used. Low-voltage subs are protected by an overload indicator lamp which warns you not to substitute if applied voltage is over 75V.



MODEL 2910

This ultra-compact substitution box has 36 components to substitute for the most common resistance and capacitance values, including a 1000 μ F low-voltage electrolytic. Fits neatly in tube caddies for handy portable use.

SPECIFICATIONS

24 Carbon Resistors: 1W, $\pm 10\%$, 10, 22, 47, 68, 100, 220, 470, 680, 1K, 2.2K, 4.7K, 6.8K ohms, 1/2W, $\pm 10\%$, 10K, 22K, 47K, 68K, 100K, 220K, 470K, 680K ohms; 2.2, 4.7, 6.8 meg. **9 Disc/Tubular Capacitors:** $\pm 10\%$, 500VDC: .0001, .0005, .001, .0025, .005, .01 μ F. $\pm 10\%$, 600VDC: .05, .10, .50 μ F. **3 Electrolytics:** 450VDC: 10, 100 μ F. 75VDC: 1000 μ F. Size (HWD): 5 x 10.8 x 10.2 cm (2 x 4.25 x 4"). Weight: 562 g (1.25 lbs.).

New 3½ Digit Lab DMM



MODEL
2830

AVAILABLE SUMMER '78

The new Model 2830 is well suited for all types of lab or bench operation. The bright 0.43" high LED display is visible under virtually all types of lighting conditions and allows for fast, easy reading. With a basic DC accuracy of 0.5% and autozeroing on all ranges, the 2830 is accurate enough for most lab or servicing applications. For added efficiency, 100% overranging reduces the need for frequent range changes.

A built-in 10 amp current shunt permits the measurement of current up to 20 amps (with overrange), quickly and without the need for an external plug-in shunt. Voltage measurement extends to 1000 volts DC or 750 volts AC, and up to 40,000 volts with the optional PR-28 probe. Seven ohms ranges provide measurement capability from 0.01 ohm to 20 megohms.

The 2830 is one of the few DMM's available with a 10 ohm range, capable of .01 ohm res-

olution. This range offers the user accurate resistance measurement of switch and point contacts, motor and coil windings, and wire lengths. The 10 ohms range provides an ideal means of locating a shorted winding in a transformer, motor or coil.

The unit is housed in an attractive and rugged cabinet which features a combination tilt stand/handle. The stand permits the 2830 to be viewed from four angles. For field use, available options include the LC-50 carrying case and BP-30 battery pack.

Selectable high-/low-power ohms permits in-circuit resistance measurements without forward-biasing semiconductor junctions. This feature operates independently from the range switch allowing high/low selection on four ranges. When switched to HIGH, pn junctions can be biased for polarity or condition tests. All ranges and functions of the 2830 are well-protected against the acci-

- Bright 3½ digit high-efficiency LED display
- 0.5% DC accuracy
- 100 μ V, 100nA, .01 ohm resolution
- 100mV AC and DC ranges
- All ranges and functions are push-button selectable
- Selectable high-/low-power ohms
- Autozeroing
- Completely overload protected
- AC operation standard with DC power pack option
- Easily installed optional battery pack
- Built-in 10 amp current shunt
- Protected against RF interference

dental application of +1000 volts DC, -450V DC or 300VAC rms. Current ranges receive the double protection of diodes and high-voltage fusing. All voltage ranges are protected to ± 1000 VDC or DC+AC peak.

OPTIONAL ACCESSORIES

Model BP-30 rechargeable battery pack. Installs in minutes with a screwdriver. Permits 8 hours of continuous use on one overnight recharging. Recharging does not interfere with the use of the 2830.

PR-21 direct/isolation probe. Has switchable 100k resistor to prevent capacitive loading when measuring DC in RF circuits.

PR-23 demodulator probe. 10kHz-125MHz ± 2 dB.

PR-28 high-voltage multiplier probe. Increases voltmeter range to 40,000VDC. See page 46 for additional information.

LC-50 leatherette carrying case for protection of Model 2830 in field service or storage. Provision for storing manual and test leads.

SPECIFICATIONS

DC VOLTAGE

Ranges: ± 100.0 mV, 1V, 10V, 100V, 1000V. **Input Impedance:** 10 megohms. **Circuit Protection:** ± 1000 VDC or AC peak, all ranges. **Polarity Indication:** Automatic, minus sign shown with plus sign implied. **Overrange:** 100% to 1999, except 1000V range.

AC VOLTAGE

Note: Average-responding circuitry calibrated to read RMS value of pure sine wave. **Ranges:** 100.0mV, 1V, 10V, 100V, 1000V. **Input Impedance:** 10 megohms. **Frequency Response:** 50-1000Hz; 50-400Hz, 1000V range. **Circuit Protection:** ± 1000 VDC or AC peak, all ranges (50Hz-1kHz). **Overrange:** 100% to 1999, except 1000V range.

DC AND AC CURRENT

Ranges: 100 μ A, 1mA, 10mA, 100mA, 1000mA, 10A. **Circuit Protection:** Diodes and externally accessible fuse, all ranges, except 10A. **Nominal Voltage Drop** (full scale): 200mV, on 100 μ A, 1mA, 10mA; 300mV on 100mA range; 1.9V on 1A and 10A ranges. **AC Frequency Response:** 50-1000Hz. **Overrange:** 100% to 1999.

RESISTANCE

Ranges: 10 Ω , 100 Ω , 1k Ω , 10k Ω , 100k Ω , 10M Ω .

High- or low-power ohms selectable on 1k Ω , 10k Ω , 100k Ω , 1000k Ω , ranges. **Circuit Protection:** No component failure other than a fuse will result with application of +1000V DC or -450VDC or 300V AC RMS to input with Ohms function selected. All ranges are protected against accidental direct connection to AC line (117V nom.). **Polarity:** Plus (+) jack is positive for all ranges. **Overrange:** 100% to 1999.

ACCURACY

Note: For all ranges add ± 1 least significant digit to accuracy indicated below. "Full scale" is at 100% of overrange or max. reading. **DC Volts:** $\pm 0.5\%$ of reading, $\pm 0.1\%$ of full scale, 1V, 10V, 100V ranges; $\pm 1.0\%$ of reading, $\pm 0.2\%$ of full scale, 100mV, 1000V ranges. **DC Current:** $\pm 1\%$ of reading, $\pm 0.5\%$ of full scale, 1mA, 10mA, 100mA ranges; $\pm 1.5\%$ of reading, $\pm 0.5\%$ of full scale, 100 μ A, 1000mA range, 10A ranges. **AC Volts:** $\pm 1.0\%$ of reading, $\pm 0.25\%$ of full scale, 1V, 10V, 100V ranges. $\pm 1.0\%$ of readings, $\pm 0.5\%$ of full scale, 100mV range; $\pm 2.0\%$ of reading; $\pm 0.5\%$ of full scale, 1000V range. **AC Current:** $\pm 1.5\%$ of reading, $\pm 0.5\%$ of full scale, 1mA, 10mA, 100mA ranges; $\pm 2.0\%$ of reading, $\pm 0.5\%$ of full scale,

100 μ A, 1000mA, 10A, ranges. **Resistance:** $\pm 1.0\%$ of reading, $\pm 0.25\%$ of full scale, 1k Ω , 10k Ω , 100k Ω , and 1000k Ω ranges in High- Ω ; $\pm 1.5\%$ of reading, $\pm 0.5\%$ of full scale, 10 Ω , 100 Ω , 1k Ω , 10k Ω , 100k Ω , 1000k Ω ranges in low- Ω . 1.5% of reading, $\pm 0.5\%$ of full scale, 10M Ω range.

GENERAL

Readout: 3½ digits .43" LED. **Overrange:** Indication: Display flashes 1999 when input exceeds 200% of value of range selected. Full overrange reading. **Polarity Indication** (DC Volts and DC Current): Automatic; minus sign shown with plus sign implied. **Operating Temperature Range:** +15°C to +35°C; usable range at reduced accuracy: 0° to 50°C. **Settling Time:** Typically 0.5 seconds. **Includes:** 2 test leads, detachable line cord, 3 spare fuses, operating manual. **Power Requirements:** 105-130VAC, 230VAC, 50/60 Hz. With three-wire detachable line cord. CSA listed. Optional BP-30 battery pack provides 8 hours (minimum) portable use on overnight recharging. **Size (HWD):** 8.1 x 29 x 19cm (3.25 x 11.6 x 7.5") including handle at rest position. **Weight:** 1.5kg. (3 lbs.)

High Readability 3½ Digit Lab Multimeter



MODEL 283

- High intensity, high reliability 3½ digit LED display for maximum readability
- Selectable HI/LO ohms function allows in-circuit resistance measurement on any range without forward biasing semiconductor junctions
- Universal AC power supply
- Easily installed optional battery pack
- Large, bright 7-segment digits
- DC accuracy, 0.5%
- Automatic polarity
- Full overload protection
- 100% overrange
- 1mV resolution
- Test leads supplied with unit

DESIGNED FOR PRACTICAL HIGH ACCURACY

The 283's advanced analog-to-digital converter takes a measurement three times per second for accurate readings. Accuracy is further ensured by the 283's high 10-megohm input impedance. Unlike some other DMM's, the 283 won't load down a high-impedance circuit. DC accuracy is 0.5% on all but the highest voltage range.

In addition to performing conventional resistance measurements, the 283 has a selectable LOW ohms function that permits accurate measurement of semiconductor-shunted resistances by limiting the test voltage to 0.2V at 100% full overrange. When switched to HIGH, PN junctions can be biased for polarity or condition tests.

The 283 has 100% overrange capability, which means that you can read to 1.999 on scales that normally read to 1.000. Out-of-range indication is very clear—when the

The 283 uses high-intensity displays that are readable at a distance of 6 feet or more in a brightly lit room. The large size and high brightness of the display makes the 283 usable in places where other digital meters are unreadable.

input exceeds the selected range plus 100% overrange, the first digit flashes and the rest display 000. The 283 also has automatic polarity indication, and complete overload protection.

The 283 has a side-handle, a separate tilt-up stand and a detachable line cord, making it more convenient for field or portable use. The unit is factory wired for 117V 50/60 Hz and may be adapted for 100V or 230V operation.

OPTIONAL ACCESSORIES

BP-83 Rechargeable Battery Pack. Installs in minutes with a screwdriver. Permits 8

hours of continuous use on one overnight recharging. Recharging does not interfere with the use of the 283.

PR-21 Isolation/Direct Probe. Has switchable 100k resistor to prevent capacitive loading when measuring DC in RF circuits.

PR-23 Demodulator Probe. ±2dB 15 kHz-125MHz.

PR-28 High Voltage Multiplier Probe. Increases the voltmeter range to 40,000 VDC. See page 40 for additional information on these devices.

LC-83 Handsome leatherette case for protection of Model 283 in field service.

ES-28 10 amp current shunt.

SPECIFICATIONS

DC VOLTAGE (Auto Polarity)

Ranges: ±1.000, 10.00, 100.0, 1000V.

Maximum DC Input: 1500VDC or DC plus AC peak.

Accuracy: ±.5% of reading, ±1 digit, 1, 10, 100V range. ±1.0% of reading, ±1 digit, 1000V range.

Polarity: Automatic

AC VOLTAGE

Note: Average-responding circuitry calibrated to read RMS value of pure sine wave.

Ranges: 0-1.000, 10.00, 100.0, 1000 VRMS.

Maximum AC Input: 1500V peak or 1500VDC plus AC peak. (i.e., 1000VRMS if pure sine wave.)

Accuracy and Response: 1V, 10V, 100V range ±1% of reading, ±1 L.S.D., 40-400Hz; 1000V range, ±1.5% of reading, ±1 L.S.D., 40-400Hz.

DC CURRENT

Ranges: ±0-1.000, 10.00, 100.0, 1000mA.

Voltage Drop: Nominal full range drop across shunts, 100mV.

Accuracy: 1, 10, 100mA ranges, ±1% of reading, ±1 L.S.D. 1000mA range, ±1.5% of reading, ±1 L.S.D.

AC CURRENT

Ranges: 0-1.000, 10.00, 100.0, 1000mA.

Voltage Drop: Nominal full range drop across shunts, 100mV.

Accuracy: 1, 10, 100mA ranges, ±1.5% of reading, ±1 L.S.D. 1000mA range, ±2% of reading, ±1 L.S.D.

Frequency Response: 40-400Hz.

RESISTANCE

Ranges: 0-100.0 ohms; 1.000K, 10.00K, 100.0K ohms; 1.000, 10.00 megohms.

Accuracy: 1K to 1000K ranges in HI ohms, ±1% of reading, ±1 L.S.D. 10 megohm range, and five lowest ranges in low ohms, ±2% of reading, ±1 L.S.D.

GENERAL

Number of Digits: 3½, plus automatic polarity.

Accuracy Temperature Coefficient (15°C to 35°C): ±.025% of reading/°C on DCV ranges; ±.05%/°C, all other ranges.

Input Impedance: 10 megohms, all voltage ranges.

Overrange: 100%, to 1.999, 19.99, 199.9 and 1999.

Overload Protection: Protected up to 1000V on ohms ranges; to 3A on current shunts; to 1500V on voltage ranges.

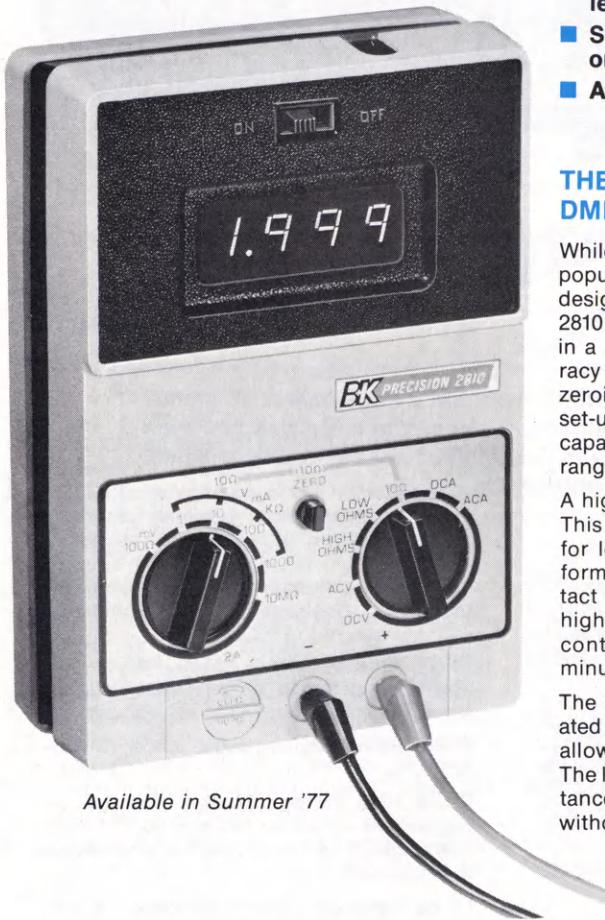
Power Requirements: 105-125VAC, 50/60Hz. also adaptable to 230VAC, 50/60Hz. With 3-wire grounded detachable AC line cord and test leads. CSA approved. **Size (HWD):** 23 x 18 x 9cm (9 x 7 x 3.5").

Weight: 1.35kg. (3 lbs.)

3-1/2 Digit DMM with .5% Accuracy

MODEL

2810



Available in Summer '77

- 3½ digit easy to read LED display
- 0.5% DC accuracy typical
- 100 μ V, .01 Ω resolution
- 10 ohm range and control to zero lead resistance
- Selectable High-/Low-power ohms on four ranges
- Auto zeroing

THE MOST VERSATILE PORTABLE DMM WE'VE EVER OFFERED!

While retaining the convenience of our popular user-oriented panel layout, we've designed into the B&K-PRECISION Model 2810 a combination of features uncommon in a portable digital VOM. Basic DC accuracy is 0.5% with a 3½ digit display. Auto-zeroing on all but the 10 Ω range minimizes set-up time, while the 100% overranging capability reduces the need for frequent range changes.

A highly valuable feature is the 10 Ω range. This range, with its .01 Ω resolution, is ideal for locating a shorted winding in a transformer, motor or coil or measuring the contact resistance of points and switches. For high accuracy, a front panel 10 Ω ZERO control allows the user to zero-out the minute amount of test lead resistance.

The high-/low-power ohms switch is operated independently from the range switch, allowing high/low selection on four ranges. The low-power ohms position permits resistance measurements in solid-state circuitry without biasing semiconductor junctions.

- Completely overload protected on all 29 ranges
- 100% overrange reading to 2000 counts full scale
- Protected against RF interference
- Completely portable

Like other B&K-PRECISION instruments, the 2810 is well protected against overloads on all ranges. The ohms circuitry is protected against momentary overloads up to 1000 volts, DC or AC peak. Continuous ohms range protection is ± 1000 V and -450 VDC or 300VAC. Current ranges receive the double protection of diodes and a fuse.

Unlike many electronic voltmeters, the 2810 can also be used in R-F energy fields. This includes use near business band, CB and amateur radio transmitters. When working with R-F circuitry, the optional PR-21 probe is also helpful.

OPTIONAL ACCESSORIES

- Model BC-28 AC battery charger
- Model BP-28 Rechargeable batteries
- Model ES-28 10 amp current shunt
- Model LC-28 Carrying case
- Model MS-28 Wire tilt stand
- Model PR-21 Isolation/direct probe
- Model PR-23 RF demodulator probe
- Model PR-28 High-voltage probe



ES-28

SPECIFICATIONS:

DC VOLTAGE

Ranges: ± 100.0 mV, 1V, 10V, 100V, 1000V. Input Impedance: 10 megohms. Circuit Protection: ± 1500 VDC or AC peak, all ranges. Polarity Indication: Automatic, minus sign shown with plus sign implied. Overrange: 100% to 1999 or 1500 VDC.

AC VOLTAGE

Note: Average responding circuitry calibrated to read RMS value of pure sine wave. Ranges: 100.0mV, 1V, 10V, 100V, 1000V. Input Impedance: 10 megohms. Frequency Response: 50-1000Hz; 50-400Hz, 1000V range. Circuit Protection: ± 1500 VDC or AC peak, all ranges (50Hz-1kHz). Overrange: 100% to 1999 or 1000 VDC.

DC AND AC CURRENT

Ranges: 1mA, 10mA, 100mA, 1000mA. Circuit Protection: Diodes and externally accessible fuse, all ranges. Nominal Voltage Drop (full scale): 200mV; 750mV on 1 amp range. AC Frequency Response: 50-400Hz. Overrange: 100% to 1999.

RESISTANCE

Ranges: 10 Ω , 100 Ω , 1k Ω , 10k Ω , 100k Ω , 1000k Ω , 10M Ω . High- or low-power ohms selectable on 1k Ω ,

10k Ω , 100k Ω , 1000k Ω , ranges. Circuit Protection: No component failure other than a fuse will result with application of $+1000$ V DC or -450 VDC or 300V AC RMS to input with Ohms function selected. All ranges are protected against accidental direct connection to AC line (117V nom.).

Polarity: Plus (+) jack is positive for all ranges. Overrange: 100% to 1999.

ACCURACY

Note: For all ranges add ± 1 least significant digit to accuracy indicated below. "Full scale" is at 100% of overrange or max. reading. DC Volts: ± 0.5 % of reading, ± 0.1 % of full scale, 1V, 10V, 100V ranges; ± 1.0 % of reading, ± 0.2 % of full scale, 100mV, 1000V ranges. DC Current: ± 1 % of reading, ± 0.5 % of full scale, 1mA, 10mA, 100mA ranges; 1.5% of reading, ± 0.5 % of full scale, 1000mA range. AC Volts: ± 1.0 % of reading, ± 0.25 % of full scale, 1V, 10V, 100V ranges; ± 1.0 % of readings, ± 0.5 % of full scale, 100mV range; ± 2.0 % of reading, ± 0.5 % of full scale, 1000V range. AC Current: ± 1.5 % of reading, ± 0.5 % of full scale, 1mA, 10mA, 100mA ranges; ± 2.0 % of reading, ± 0.5 % of full scale, 1000mA

range. Resistance: ± 1.0 % of reading, ± 0.25 % of full scale, 1k Ω , 10k Ω , 100k Ω , and 1000k Ω ranges in High- Ω ; ± 1.5 % of reading, ± 0.5 % of full scale, 10 Ω , 100 Ω , 1k Ω , 10k Ω , 1000k Ω ranges in low- Ω . 1.5% of reading, ± 0.5 % of full scale, 10m Ω range.

GENERAL

Readout: 3½ digits, .3" LED. Overrange Indication: Display flashes 1999 when input exceeds 200% of value of range selected. Full overrange reading. Polarity Indication (DC Volts and DC Current): Automatic; minus sign shown with plus sign implied. Operating Temperature Range: $+15^\circ\text{C}$ to $+35^\circ\text{C}$; usable range at reduced accuracy: 0°C to 50° . Settling Time: Typically 0.5 seconds. Includes 2 test leads. Power Requirements: Four "C" size batteries—Ni-Cad, alkaline or carbon-zinc, with provision for AC charger (Batteries and AC charger not supplied.) Battery Life: Better than 40 hours of continuous use with alkaline batteries. Size (HWD): 16 x 11 x 5cm (6.4 x 4.4 x 2E). Weight: 907g. (2 lbs.).

Economy 3-1/2 Digit Portable DMM

MODEL **2800**



- Reliable—fully overload protected
- 3-1/2 digit easy to read LED display
- Completely portable—use it anywhere!
- High-/Low-power ohms for in-circuit accuracy

The B&K-PRECISION Model 2800 digital multimeter combines full features with low price. Features include an auto-zero circuit that functions on all ranges and high overload protection. The 2800 features 22 scales that range as high as 1000 volts, DC or AC, making the 2800 prepared for most any DMM application. Resolution is to 1mV, 1 μ A or 0.1 ohm. Input impedance is 10 megohms.

The 2800 has 100% overrange reading capability. This allows you to read 1999 on a scale normally limited to a maximum reading of 1000, reducing frequent range changes. All ranges are well protected against overloads. Ohms circuitry protection ranges from +100V and -450VDC or 300VAC continuously to momentary overloads up to

- Auto zeroing
- 1mV, 1 μ A, 0.1 ohm resolution
- 10 meg input impedance, industry standard
- Excellent temperature coefficient
- DC accuracy 1% typical

1000 volts DC or AC. All DC and AC voltage ranges are protected up to \pm 1000 VDC or AC RMS. Decimal point, polarity and out-of-range indications are automatic. The 2800 can be powered by ordinary "C" cells or optional rechargeable batteries.

Alternating high-/low-power ohms ranges permit analysis of solid-state circuitry without biasing semiconductor junctions. In the low-power ohms range, <0.2 volt is developed across the measured resistance. When switched to a high-power ohms range, <2 volts is developed.

The 2800 comes complete with test leads, detailed operating manual and spare fuse. A full range of optional accessories are also available.

See page 20 for Optional Accessories.

SPECIFICATIONS

VOLTAGE

AC-DC Ranges: \pm 0-1V, 10V, 100V, 1000V. **Input Impedance:** 10 megohms. **Polarity Indication:** Automatic, minus sign shown with plus sign implied.

Frequency Response: 50-400 Hz. **Circuit Protection:** \pm 1000VDC or AC RMS, all ranges (50Hz-1kHz). **Note:** Average reading circuitry calibrated to read RMS value of pure sine wave.

CURRENT

Ranges: 0-1mA, 10mA, 100mA, 1000mA. **Circuit protection:** Diodes and externally accessible fuse, all ranges. **Nominal Voltage Drop:** 100 to 300mV. **AC Frequency Response:** 50-200Hz.

RESISTANCE

Ranges: 0-100 Ω , 1k Ω , 10k Ω , 100k Ω , 10M Ω . (Alternate ranges are Hi and Lo power; all Lo power ranges are 100mV at full scale; Hi power, 1V at full scale.) **Circuit Protection:** No component failure other than a fuse will result with application of +1000V DC or -450V DC or 300V AC RMS to input with Ohms function selected. All ranges are capable of direct connection to AC line (117V nom.). **Polarity:** Plus (+) jack is positive for all ranges.

ACCURACY

Note: Add \pm 1 least significant digit to accuracy indicated. **DC Volts:** \pm 1% of reading, \pm 0.25% of full scale, three lowest ranges; \pm 1.5% of reading, \pm 0.25% of full range, 1000V range. **DC Current:**

\pm 2.0% of reading, \pm 5% of full range, \pm LSD, 1mA, 10mA, 100mA Ranges. \pm 2.5% of reading, \pm 5% of full range, \pm 1 LSD, 1A Range. **AC Volts:** \pm 1.5% of reading, \pm 5% of full range, \pm 1 LSD, 1V, 10V, 100V Ranges. \pm 2.5% of reading, \pm 5% of full range, \pm 1 LSD, 1000V, Ranges. **AC Current:** \pm 2.0% of reading, \pm 5% of full range, \pm 1 LSD, 1mA, 10mA, 100mA Ranges. \pm 3.0% of reading, \pm 5% of full range, \pm 1 LSD, 1A Range. **Resistance:** \pm 1.5% of reading, \pm 5% of full range, \pm 1 LSD, 100 Ω , 1k Ω , 10k Ω , 100k Ω and 1 meg Ω Ranges. \pm 2% of reading, \pm 5% of full range, \pm 1 LSD, 10meg Ω Range.

GENERAL:
Same as Model 2810, page 20.

New Solid-State Temperature Probe

MODEL

TP-28



AVAILABLE FALL '78

- Measure temperature with almost any voltmeter—analog or digital!
- Reads in degrees Fahrenheit and Celsius—selected by switch
- Resolves to .01° with \pm 1.7°C or \pm 3°F
- Operates for at least 120 hours on inexpensive battery
- Measures temperature of any surface, liquid or gas

APPLICATIONS

Locate circuit "hot spots" where components are drawing excessive current... Isolate underwattage components... Ensure that components do not exceed their maximum allowable temperature ratings . . .

Monitor temperature for environmental tests . . . Monitor cabinet temperature... Measure temperature of walls, floor or ceiling to determine where additional insulation is needed... Locate cold-air leaks... Check tapwater temperature... Drive chart recorder, for long-term temperature measurement.

Add the TP-28 to any analog or digital voltmeter and you'll be able to accurately measure temperature from -50°C to +150°C (-58°F to +302°F). Unlike ordinary thermometers, the TP-28 is fast—a settling time of 10 seconds will bring accuracy within 1°C. Even the temperature of small components (such as integrated circuits, transistors and resistors) can be accurately determined.

*Depending on voltmeter sensitivity

SPECIFICATIONS

TEMPERATURE

Fahrenheit Range: -58° to +302°. **Celsius Range:** -50° to +150°. **Sensitivity:** 10mV per °Celsius or Fahrenheit. **Resolution:** 0.01° (with adequate voltmeter sensitivity). **Accuracy:** \pm 1.7°C or \pm 3°F. **Maximum Voltage:** 500 volts peak between

probe tip and circuit low. **Settling Time:** 10 seconds for stated accuracy (in immersion).

GENERAL

Meter Requirements: Input impedance must be in excess of 10k Ω . Voltage range must cover 0 to 3 volts DC. (analog or digital). **Battery Life:** 120

hours continuous use. **Low Battery Indicator:** Meter will indicate a continuous negative temperature (approx. -100°C or F). **Battery Requirements:** 9 volts, Eveready type 216 or equivalent. **Size:** 8.75 x 5 x 2.8 cm (3 1/2 x 2 x 1 1/8"). **Cable Length:** 4'. **Weight:** 2.25kg (5 oz).

Compact VOMs

MODEL

115



LC-15 CASE
OPTIONAL

MODEL

110



LC-10 CASE OPTIONAL

- 5 ohm mid-scale ohms range for motor and coil winding checks
- 30,000 ohms/volt DC
- Optional 12kV DC high-voltage probe adapter available
- Mirrored scale for accuracy
- 22 ranges color-coded to scales
- Fuse protected ohms ranges

The 115 is a quality 30,000 ohms/volt instrument that should not be confused with inexpensive "look-alikes." Unusual features

include a 5 ohm mid-scale range for checking the windings of coils, transformers and motors; and four DC current ranges to allow checks of thermocouples and oil burner controls. DC and AC voltage measurement extends to 1200 volts. Meter scales are uncluttered and simplified. The full-arc mirror eliminates parallax errors.

The 115 is small enough to fit in your tool kit. Test leads, and instructions are included; carrying case is optional. Model HV-12 high-voltage probe adapter is also optional and allows the 115 to read to 12kV DC.

SPECIFICATIONS

DC Volts: 0-60, 300, 1200mV; 0-3, 12, 60, 300, 1200V. **DC Current:** 0-0.03, 0.06; 60, 600mA. **DC Accuracy:** $\pm 3\%$ full scale. **AC Volts:** 0-6, 30, 60, 300, 600, 1200. $\pm 4\%$ full scale. **Resistance:** 0-500, 50k, 500k, 5M Ω . **Meter:** 30,000 Ω /VDC; 15,000 Ω /VAC. **Battery Requirements:** 1.5V "AA"

battery; 15V W-10 battery. **Optional Accessories:** LC15 Case; HV-12, 12kV probe adapter. For low-current applications, such as checking electrostatic air cleaners. **Size (HWD):** 10.2 x 15 x 4.4 cm (6 x 4 x 1.75") **Weight:** .45kg (.5 lb.)

- 10 ohm mid-scale ohms range
- 20,000 ohms/volt DC
- Fuse protected ohms range
- 16 ranges color-coded to scales
- $\pm 3\%$ DC accuracy

The 110 is loaded with features for most any application. The 10 Ω mid-scale range allows accurate testing of coil and motor

windings—even on high current motors. Leakage resistances up to one megohm can also be measured. For accurate low-voltage measurements, 2.5 volt full-scale and 250mV ranges are provided.

DC sensitivity is 20,000 ohms/volt and full-scale DC accuracy is $\pm 3\%$. Test leads and detailed instructions included; case is optional.

SPECIFICATIONS

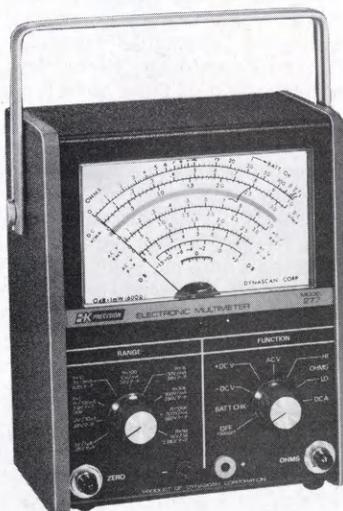
DC Volts: 0-2.5, 10, 50, 250, 1000V **DC Current:** 0.05, (250mV), 25, 250mA **DC Accuracy:** $\pm 3\%$ full scale **AC Volts:** 0-10, 50, 250, 500, 1000 **AC Accuracy:** $\pm 4\%$ full scale **Resistance:** 0-1k, 100k,

1M Meter: 20,000/VDC; 10,000/VAC. **Battery Requirements:** 1.5V "AA" battery **Optional Accessory:** LC-10 Case **Size (HWD):** (5 x 3.5 x 1.5") **Weight:** .35kg (.4 lb.)

Portable Electronic Multimeter

MODEL

277 FET VOM



- High- and low-power ohms ranges for transistor circuit test
- 1 μ A full scale current range for semiconductor leakage tests
- 15 meg input impedance
- 52 ranges; overload protected
- Checks its own batteries

See LC-27 case on page 45 and optional PR-28 high-voltage probe on page 46.

SPECIFICATIONS

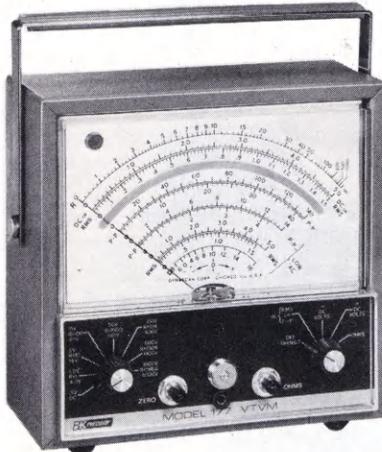
Meters: 1% precision, freq. compensated. **Meter:** 4.5"; 50 μ A movement, mirrored scale. **Protection:** Fully overload protected; current and resistance circuits protected by fuse. **DC Volts:** 0-1, .3, 1, 3, 10, 30, 100, 300, 1000; zero-center capability on all ranges; $\pm 2\%$ F.S.; input resistance, 15 megs. **AC Volts:** RMS, (same as DC); peak-to-peak, 0-28, .88, 2.8, 8.8, 28, 88, 280, 880, 2800; $\pm 3\%$ F.S.; input z, 10 megs shunted by

Model 277 is a versatile, battery operated 100% solid state unit with 0-1 μ A DC current scale for sensitive semiconductor leakage testing and 0-0.1VDC and VAC scales for measuring transistor bias and high-low ohms. Includes Model PR-21 Probe with 100K isolation resistor to prevent capacitive loading when measuring DC in RF circuits.

100pF; freq. response, flat; 50Hz-150kHz. **DC Current:** 0-1, 10, 100 μ A; 0-1, 10, 30, 100, 300, 1000mA; $\pm 3\%$ F.S. **Resistance:** Rx1, x10, x100, x1K, x10K, x100K, x1 meg. **Decibels:** 9 ranges from <20 to +60dB; $\pm 3\%$ F.S. (0dB = 1mW into 600 ohms). **Power:** One 9V 2V6 battery and one 1.5V "D" cell (not included). **Size (HWD):** 18 x 14.5 x 9.1 cm (7.25 x 5.82 x 3.63"). **Weight:** 907g. (2 lbs.).

Vacuum Tube Voltmeter

MODEL 177



For optional AV2B high-voltage probe and optional AV-1A demodulator probe, see pages 46 and 47.

- Built-in DC supply—no ohms battery
- Special .5 volt DC scale for solid state measurements
- Separate peak-to-peak and RMS scales
- Special calibration on low AC ranges
- Special dB scale for amplifier gain measurements up to 4 MHz
- DC polarity reversal switch.

This rugged VT VM is designed to withstand the roughest treatment on the production line, laboratory or service bench. The large 7" mirrored scale meter makes it ideal for use in situations where the meter must be read from a distance. The Model 177 closely duplicates char-

- Zero center scale for FM discriminator alignment
- Large 7" mirrored meter for easy reading without parallax
- High-impact Cycolac Probe
- 1% precision resistors in critical circuits
- Direct replacement for RCA's Senior Voltohmyst

acteristics and performance of the Senior Voltohmyst previously manufactured by RCA, but with the added advantage of a built-in DC supply for resistance ranges—eliminating the need for ohmmeter battery replacement.

SPECIFICATIONS

DC Volts: (Full Scale) $\pm 0.5, 1.5, 5, 15, 50, 150, 500, 1500$.

AC Volts (RMS): 0.1, 5, 15, 50, 150, 500, 1500.

AC Volts (Peak-to-Peak): 4, 14, 40, 140, 400, 1400, 4000.

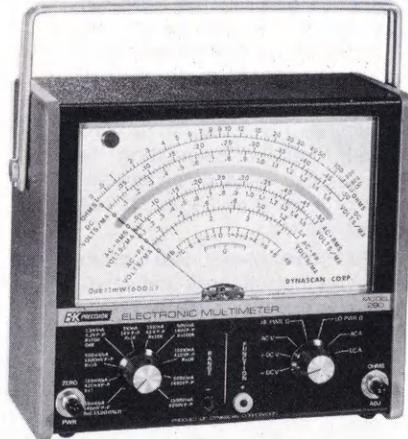
Response: ± 1 dB, 40 Hz to 4MHz (600 ohm source, 5 volt range).

dB Scale -6 to +16dB, +4 to +26dB, +14 to +36dB, +24 to +46dB, +34 to +56dB, +44 to +66dB (0.7775 volts into 600 ohm line on 0-5 volts AC scale = 0dB).

Resistance (Full Scale): 1,000, 10,000, 100,000 ohms; 1, 10, 100, 1,000 megohms. **Resistance (Mid-Scale):** 10, 100, 1,000, 10,000, 100,000 ohms; 1, 10 megohms. **Input Resistance:** 11 meg (1 meg in probe). **Accuracy:** DC, $\pm 3\%$ full scale, AC, 5%. **Meter Sensitivity:** 100 microamperes. **Built-in DC Supply:** No ohmmeter battery required. **Includes:** PR-43 probe. **Optional Probes:** AV-1A 250MHz RF probe; AV-2B 50k VDC high-voltage probe. **Power Requirements:** 105-125 VAC, 50-60 Hz. **Size:** 7 1/2" x 7 1/4" x 3 5/8" (18 x 18 x 9cm). **Weight:** 6 lbs. (2.24 kg). CSA listed version available.

Solid State Electronic Multimeter

MODEL 290 FET METER



- 75 ranges; $\pm 1.5\%$ VDC accuracy
- High and low-power ohms ranges
- 15 meg FET input
- Fully overload protected
- 50mV AC and DC full scale

The 290 is our most accurate, sensitive FET meter. It is designed to meet the measurement requirements of the industrial user, engineer, radio/TV/audio technician and serious hobbyist. Its 75 ranges include special high and low-power ohms ranges (detailed in box above) plus a special Rx0.1 low-ohms range with 1 ohm center scale. It also measures AC and DC current from 50 μ A to 1.5A. There's also a zero center scale to

- 50 μ A full scale current range
- Rx0.1 ohm range with 1 ohm center scale.
- Direct replacement for RCA master voltohmyst

help simplify FM alignment. The 290 uses precision 0.5% multipliers and is fully AC operated with internal zener-regulated power supplies. The meter, FET input and all circuitry are fully overload protected. The 290 comes with the PR-21 Probe, which has a switchable 100K isolating resistor to prevent capacitive loading when measuring DC in RF circuits. Optional PR-28 High-Voltage Multiplier probe extends the 290's range to 40,000 volts. See other probes on page

SPECIFICATIONS

VOLTS

10 Ranges: 0-50, 150, 500mV; 1.5, 5, 15, 50, 150, 500, 1500V. **DC Accuracy:** $\pm 1.5\%$ F.S. **AC Rejection:** Greater than 46dB at 60Hz.

10 Peak-to-Peak AC Ranges: 0-140, 440mV; 1.4, 4.4, 14, 140, 440, 1400, 4400V. **AC Accuracy:** $\pm 3\%$ F.S. at 60Hz; $\pm 5\%$ on 500V and 1500V ranges.

Input Impedance: 15 megs shunted by 41pF at input jacks. **Frequency Response:** 50mV-150V ranges, ± 0.5 dB, 20Hz-500kHz; ± 3 dB, 5Hz-750kHz.

DECIBELS

10 Ranges: -40 to +66dB. **Accuracy:** $\pm 3\%$ F.S. (0dB = 1mW across 600 ohms).

CURRENT

10 Ranges: 0-50, 150, 500 μ A; 1.5, 5, 15, 50, 150, 500mA; 1.5A. **DC Accuracy:** $\pm 3\%$ F.S., except $\pm 4\%$ on 1.5A range. **AC Accuracy:** $\pm 4\%$ F.S. at 60Hz; $\pm 5\%$ on 50 μ A and 1.5A ranges. **Frequency Response:** $\pm 5\%$ dB, 20Hz-5kHz; ± 3 dB, 7Hz-16kHz.

Internal Voltage Drop: At input terminals, 50mV to 50mA range.

RESISTANCE

8 Low-Power Ranges (33mV source): Rx0.1, Rx1, Rx10, Rx100, Rx1K, Rx10K, Rx100K, Rx1 meg. **Center Scale Reading:** 1 ohm, Rx0.1; 10 ohms, Rx1 range. **Accuracy:** $\pm 3^\circ$ of arc.

GENERAL

Meter: 7", with 6.63" scale arc length; 100 μ A movement, $\pm 2\%$, 100 $^\circ$; mirrored scale. **Protection:** Meter and FET input protected against overloads. Circuit overload protection by diodes and fuse; spark gaps for high voltage protection. **Includes:** PR-21 isolation Probe. PR-28 high-voltage probe optional. **Power Required:** 105-124 VAC, 50-60Hz; also available for 230 VAC, 50/60Hz. 3.9W, three-wire grounded cord. **Size (HWD):** 18 x 20 x 9cm (7.25 x 8 x 3.63"). **Weight:** 1.96kg (4.25 lbs.). CSA listed.

New Portable Digital Capacitance Meter



AVAILABLE FALL '78

MODEL

820

- Measures capacitance from 0.1pF to 1 Farad
- Resolves to 0.1pF
- 10 ranges for accuracy and resolution
- 4 digit easy-to-read LED display
- 0.5% accuracy
- Special lead insertion jacks or banana jacks
- Fuse protected
- Uses either rechargeable or disposable batteries
- Overrange indication

APPLICATIONS

Measure value of unmarked capacitors... Verify that capacitors are within tolerance... Checks all capacitors from miniature discs to pole-mounted power types... Measure cable capacitance... Select and match capacitors for critical circuit applications... Sample production components for quality assurance... Measure capacitance of complex series-parallel capacitor networks... Set trimmer capacitors to specific amounts of capacity... Check for excessive capacitance in switches and other components.

For capacitance measurement in lab or field, B&K-PRECISION introduces the new Model 820 Digital Capacitance Meter. The 820 is an economical multi-range capacitance meter that features digital accuracy and full portability.

Ten ranges cover from 0.1pF to 999,900 μ F with resolution to 0.1pF. The capacitance of virtually any capacitor can be measured quickly and accurately with the 820. Because the accuracy of this unit greatly exceeds the tolerance of most capacitors, required values can be "hand selected." Matched capacitors can also be singled out for use in bridge circuits and other critical applications.

For production line applications, the 820 is an excellent means of pre-testing critical capacitors. It's so easy to use that untrained workers can be quickly instructed on proper operation. For incoming component sorting and selection, the front-panel lead insertion jacks offer fast in-out testing.

As an educational tool, the 820 can be used to verify capacitor network calculations by measuring the actual value of a network. The operation of a variable capacitor can also be demonstrated.

THE B&K-PRECISION Model 820 comes with tilt stand, detailed manual and spare fuse. Optional accessories include the BC-28 charger, BP-28 rechargeable battery pack and LC-28 carrying case.

SPECIFICATIONS

CAPACITANCE

Range: 10 selectable ranges with full scale value from 999.9 picofarads to 999.9 millifarads (reads from 0.1pF to 999.9 millifarads). **Accuracy:** 0.5% of full scale, ± 1 digit to 100 μ F; 1% of full scale, ± 1 digit from 1 millifarad to 1 Farad. **Resolution:** 0.1pF. **Reading Time:** 0.3 sec to 1000 μ F, increasing to 35 sec maximum at 1 Farad. **Overrange**

Indicator: (All Ranges) All bottom segments of the digits are "ON" when the capacitor value exceeds the value of the range selected.

GENERAL

Display: 4 digits LED display. **Front Panel Controls:** 10-position range switch, zero adjust, ON-OFF switch. **Power Source:** 4 standard "C" size cells operating from 4-6 volts, nicad, alkaline or

zinc carbon, with provision for charger (Note: batteries and charger are not supplied.). **Battery Life:** 8 hours minimum. **Operating Temperature:** 0°C to 50°C (32° to 100°F). **Dimension:** 16 x 11 x 6cm (6.4 x 4.4 x 2.3"). **Weight:** 675g. (1.51 lbs.) with batteries. **Optional Accessories:** BC-28 charger, BP-28 battery pack, LC-28 carrying case, battery.

New 50MHz Digital Probe



MODEL

DP-50

- Multi-family, compatible with TTL, DTL, RTL, HTL, CMOS, MOS and HiNIL
- Displays DC to 50MHz
- Displays pulse presence and logic states
- Memory mode to "freeze" pulse display
- Pulse mode "stretches" short pulses
- 2 megohm input impedance
- Input overload protected
- Typically detects pulses to 10 nanoseconds

APPLICATIONS

Simplify and speed debugging of digital circuits...Analyze digital circuits for design changes...Trace a pulse throughout a circuit...Demonstrate logic state changes and digital circuit operation for classroom use...Microprocessor troubleshooting...Digital control circuit troubleshooting...MRO applications.

The new B&K-PRECISION DP-50 50MHz digital probe simplifies the troubleshooting and analysis of digital circuits by clearly displaying in-circuit logic activity. The DP-50 is a multifamily device that is compatible with TTL, DTL, RTL, HTL, CMOS, MOS and high-noise immunity logic (HiNIL).

This compact instrument is easy to handle in tight spaces yet includes every important logic probe feature. Three bright LED indicators display pulse presence and high- and low-logic states. Unlike many logic probes, the DP-50 digital probe will continue to indicate pulse presence through its maximum frequency of 50MHz.

For high-speed or intermittent pulses, the DP-50 offers a MEMORY mode to "freeze" and store the pulse display. In the PULSE mode, short duration pulses are "stretched" for a clear visual indication. To ensure that the instrument has absolutely no effect on the circuit under test, the DP-50 maintains a very high 2 megohm input impedance in all modes. This impedance is significantly higher than most ordinary logic probes.

Like other B&K-PRECISION instruments, the DP-50 is fully overload protected and will withstand ± 50 VDC at the input tip. Reverse polarity protection for the power leads is also 50 volts. The DP-50 is housed in a lightweight but rugged case with a stainless-steel tip.

SPECIFICATIONS

INPUT CHARACTERISTICS

Maximum Input Frequency Displayed: 50MHz.
Minimum Detectable Input Pulse Width: 20ns (10ns typical).
Duty Cycle: LED intensity is directly proportional to duty cycle observed, up to 50MHz (and a 10 to 1 ratio).
Pulse Standard Mode: Will detect and stretch any input pulse. **Memory**

Mode: Will detect and latch any input pulse.

LOGIC THRESHOLDS

TTL/DTL: Logic One: 2.4V; Logic Zero: 0.8V.
CMOS: Logic One: 70% of supply voltage; Logic Zero: 30% of supply voltage. **Input Overload Protection:** ± 50 VDC. **Input Impedance:** 2 megohms in all modes.

GENERAL

Power Requirements: 5 to 15VDC (40mA @ 5VDC; 150mA @ 15VDC) protected to +20VDC. **Reverse Polarity Protection:** -50VDC. **Operating Temperature:** 0 - 50°C. **Size (HWD):** 16.25 x 3.12 x 1.9cm (6.5 x 1.25 x .75"). **Lead Length:** 75cm (30"). **Tip Length:** 1.25 cm (0.5"). **Weight:** 98g. (3.5 oz).

Lab-Quality Semiconductor Tester...



MODEL 530

- Measure f_T of bipolar transistors up to 1500 MHz
- Nondestructive testing of transistor and diode breakdown voltages
- Measures transistor beta or FET g_m
- Measures all transistor breakdown and leakage parameters
- Fast testing of transistors, FET's, and SCR's—in or out-of-circuit
- Base diagrams are not required
- No biasing information required
- Identifies all leads of transistors and SCR's
- Automatic identification of PNP/NPN types and N- or P-channel FET's

New from B&K-PRECISION, the Model 530 semiconductor tester can actually perform more tests on more devices than any other comparably priced semiconductor tester. Our top-of-the-line instrument features an exclusive transistor gain-bandwidth product measurement capability, allowing evaluation up to 1500 MHz for bipolar transistors. Other innovative features include nondestructive testing of transistor, SCR, and diode breakdown voltage up to 100 volts, reverse leakage, and gain of all types of transistors, including power FET's.

In addition to being one of the most complete semiconductor testers available, the 530 is also one of the easiest and fastest

to use. No charts, tables or calculations are required for basic operation, nor is additional equipment required. The 530 is a direct reading stand-alone instrument. Even unskilled assembly line workers can perform quality control tests with minimal training. Both visual and aural indications are provided.

In the engineering lab, the 530 provides a full range of accurate data. The exclusive transistor gain-bandwidth product (f_T) measurement capability permits high frequency evaluation of bipolar transistors with 20% accuracy. A dedicated meter clearly displays f_T frequency. This feature will enhance your capability to select trans-

sitors for application in modern VHF and UHF circuits.

Patented Dynapeak® circuitry (see description on page 18) allows accurate in-circuit testing and lead identification of diodes, transistors, FET's and SCR's, even in low-impedance circuits.

Low duty cycle, high drive currents permit reliable testing of power transistors in circuit, eliminating the time consuming task of removing hardware. Even the new vertical power FET's can be tested. Bright LED's always provide a positive indication of whether a transistor is good and whether it is an NPN, PNP, or N- or P-channel FET.

SPECIFICATIONS

IN-CIRCUIT TESTS

Good/Bad Test: For bipolar transistors, FET's and SCR's. **Identifies:** all leads of bipolar transistors and SCR's; gate lead of FET's; device polarity by automatically identifying PNP, NPN, and P- or N-channel FET's.

OUT-OF-CIRCUIT TESTS

Measures: β , using two collector current ranges (low-power β 0-600; high power β 15-200) $\pm 10\%$. **gm of FET's:** low-power, 0-30 millimhos; high power, 30-425 millimhos, $\pm 10\%$. The low duty cycle pulsed testing system makes possible the testing of power transistors and FET's at collector or source currents up to 2 amps. **f_T :** (unity-gain frequency or gain-bandwidth product) Three ranges (0-100 Mhz, 0-500 Mhz, 0-1500 Mhz) $\pm 20\%$ @ room temperature. **Leakage test:** BVces,

ICes; BVcbo, Icbo; BVceo, Ico; BVecs, Iecs; BVeco, Ieo; BVbbo, Ieo. **PIV of diodes and gate Leakage of FET's** (.5 μ A to 5mA at 0V to 10V; .5 μ A to 100 μ A at 0V to 100V). Current limiting prevents damage to device under test. Idss of FET's (.5 μ A to 5mA).

INDICATORS

Audible tone for GOOD indication; switch overrides tone defeat, LED's identify device polarity. Panel Indicator and Test Switch identifies all leads of transistors and SCR's and gate lead of FET's. Meters indicate other device parameters.

APPLIED TEST CURRENTS

(3% duty cycle)—**Collector:** 100 mA. **Base:** 200 mA (Hi drive); .75 mA (low drive). **Test Repetition Rate:** 6 per second. **Voltage for Leakage Test:**

Variable from 0-100 VDC. **High-power β and gm tests:** Special 300 μ S, 1% duty cycle current pulses enable testing at 2 amps without over-dissipation of device under test. Maximum β (200) and maximum gm (425 millimhos) correspond to test current of 2 amps.

LIMITING IN-CIRCUIT SHUNT VALUES

Resistance: $>10\Omega$ (Hi drive); $>1.5K\Omega$ (Lo drive). **Capacitance:** $<15\mu$ F (Hi drive); $<0.3\mu$ F (Lo drive).

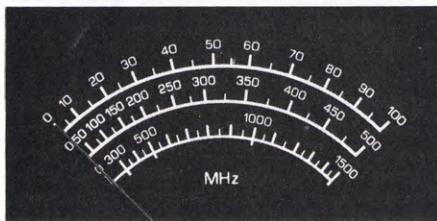
GENERAL

Color-coded Mini-Lock clip leads for hands-free operation; detailed instruction manual. Optional: FP-5 Dynaflex three-lead, one-hand probe for easy in-circuit testing. Power: 105-125 VAC, 60 Hz, 10 watts. Size (HWD): 10 x 33.6 x 25.6 cm; (4 x 13.5 x 10.25"). Weight: 2.3 kg; (5 lbs.) CSA approved.

...measures unity-gain frequency (f_T) & other important parameters

FEATURES

- Leakage current (I_{CES}) and drain-to-source current (I_{DSS}) are readable from as little as $.5 \mu\text{A}$ to 5 mA on one large meter scale.
- Unique feature provides nondestructive testing of transistor breakdown voltage (BV_{CES}) and PIV of diodes, up to 100 volts.
- High- and low-power ranges are provided for easy and accurate measurement of the most common beta values (0-600; 15-200) and most common g_m values for FET's (0-30 millimho; 30-425 millimho).



ACCURATE f_T MEASUREMENTS

Simply plug in or connect to the transistor to be tested. Set the range switch to the position that gives the highest f_T reading as observed on the dedicated meter. No adjustments or calculations are required.

- Low duty cycle, high drive currents permit reliable testing of power transistors in-circuit. Lo drive feature for out-of-circuit transistor testing identifies E-B-C leads.
- Special 300 μsec , 1% duty cycle high current ($I_C = 2 \text{ amp}$ for $\beta = 200$) pulsing circuit for accurate testing of power transistors and power FET's.
- Electronic current limiting always assures safe testing of all types of semiconductor devices—even delicate MOS FET's.
- Exclusive transistor gain-bandwidth

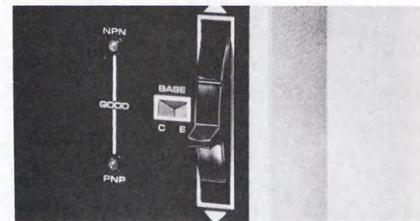


BETA, AND LEAKAGE TESTS

True beta and g_m are indicated in addition to leakage. Beta and g_m tests and measurements are provided for signal and power devices. These include power transistors and power FET's. Leakage currents are shown directly on the meter scale, up to 5 mA.

product measurement capability permits high frequency evaluation of transistors.

- Audible tone indicates good device—no weak borderline indication.
- Mini-lock clips that keep hands free.
- Color coded switch indicates base lead so that both hands can be used in connecting difficult-to-reach in-circuit transistors.
- Test switch locks in "GOOD" position so additional tests can be made without memorizing test switch position.



AUTOMATIC LEAD AND POLARITY IDENTIFICATION

When the transistor has been connected, the lever is advanced until the NPN or PNP LED is lit. This indicates the device polarity (NPN, PNP, or N- or P-channel FET), while the color-coded window reveals the lead connections.

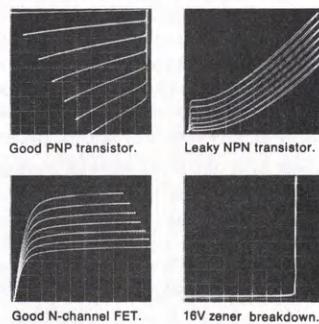
MODEL 501A



- Display characteristic curves for all semiconductor devices on your scope
- Measure breakdown voltage non-destructively
- Identify unknown devices
- Complete with FP-5 probe

Each different type of semiconductor device has its own set of unique characteristic curves. By examining these curves you can determine operating characteristics of the device you are testing—including gain (beta), cutoff current, leakage current, output admittance and any other measurable specification. The 501A simulates actual operating conditions by ap-

plying sweep voltage to the collector while varying base current (voltage for FET's) in five steps. After making the simple connection to any scope with an external horizontal input you can observe the characteristic curve.



SPECIFICATIONS

COLLECTOR SWEEP—Range: 0-100VDC peak at 100mA maximum. **Polarity**: NPN (N-Channel) or PNP (P-channel). **Current Limiting**: Automatic at approximately 130% of full scale for each vertical attenuator range.

STEP GENERATOR—11 Current Ranges: 1, 2, 5, 10, 20, $50 \mu\text{A}$ per step; .1, .2, .5, 1, 2mA per step; $\pm 3\%$ constant-current steps. 5 Voltage Ranges: .05, .1, .2, .5, 1V per step, $\pm 4\%$; source resistance, 1K. **Number of Steps**: Six, continuous display. **Step Polarity**: Same as Collector Sweep (NPN or PNP); inverted in VOLTS/STEP positions.

CALIBRATION—Source: $\pm .05$ to 5V p-p, $\pm 3\%$

accuracy. **Attenuator Range**: 1, 2, 5, 10mA per division vertically, $\pm 3\%$.

GENERAL—**Sockets**: Two TO-5 type transistor sockets (right and left) with each pin (three per socket) paralleled by a banana jack for external cables. Slide switch selects right or left socket. **Output Terminals**: Banana jacks for vertical, horizontal and ground outputs to oscilloscope. **Measures**: AC and DC beta...Diode dynamic resistance...All SCR, diac and triac characteristics...All transistor characteristics, including I_{CEO} and I_{CES} leakage...Switching transistor saturation voltage...Thermal runaway susceptibility...FET "on" resistance...N- and P-channel

J-FET and depletion-mode MOSFET characteristics, including transconductance...Enhancement-mode MOSFET characteristics with external DC bias supply...Tunnel diode characteristics, including average value of negative resistance...Breakdown voltage with non-destructive test. **Accessories Included**: Cables to scope, mylar 10x10-division graticule, detailed instruction manual and FP-5 probe (shown on page 41). **Power Requirements**: 105-125VAC, 50-60Hz; also available for 230VAC, 60Hz. With three-wire line cord. **Size (HWD)**: 10.2 x 25 x 24cm (4 x 10 x 9.5"). **Weight**: 1.35kg. (3 lbs.). CSA approved version available.

Industrial Transistor Tester



WHY THE PATENTED DYNAPEAK™ TEST IS RELIABLE

Typical forward conductance threshold (turn-on) voltage for germanium devices is about 300mV; for silicon devices, about 700mV. When the device is shunted by low resistance or high capacitance, common in today's circuits, the generator must be able to provide several volts of output with high current and low internal series resistance.

The 520B will work reliably in circuit with shunt resistance as low as 10 ohms and capacity as high as 15 μ F. Because the Dynapeak™ system is programmed to apply power with only a 3% duty cycle, maximum energy applied to the junction is well below

the safe level for both the device and its associated components. So it can apply several volts in low-impedance circuits when necessary with no danger. In a similar situation, a square-wave generator type of transistor tester with enough power to turn on the device would probably destroy it.

In practice, other testers simply will not cause the device to conduct, leading to erroneous test results and wasted time as you unsolder the device and find it tests perfectly well out-of-circuit. Only Dynapeak testers can reliably test semiconductors in low-impedance circuits.

SPECIFICATIONS

IN-CIRCUIT TESTS:

Good/Bad Test: For PNP and NPN transistors, FET's and SCR's.

Identifies: NPN or PNP; N- or P-channel FET's.

OUT-OF/CIRCUIT TESTS:

Good/Bad Test: For PNP and NPN transistors, FET's, SCR's, leakage and loss.

Identifies: NPN or PNP; silicon or germanium transistors.

Measures: Reverse leakage from 0.1 μ A to 5mA.

AUTOMATIC INDICATORS—Audible Tone for GOOD indication. LED Lamps identify NPN or PNP devices and Ge or Si types. Test Switch automatically identifies base or gate lead for good transistors or FET's. **Meter Scales:** Readable from 0.1 μ A to 5mA for I_{ce} leakage; calibrated for silicon and germanium power and signal transistor leakage limits.

APPLIED TEST CURRENTS—**Collector:** 250mA at 3% duty cycle. **Base:** 125mA at 3% duty cycle. **Test Repetition Rate:** 10 per second. **Leakage Test Reverse Voltage:** 2.0V.

MODEL 520B

- Now with HI/LO Drive
- Works in-circuit when others won't
- Identifies all three transistor leads
- Random lead connection
- Audibly and visually indicates GOOD transistor
- Automatic NPN/PNP determination
- Positive Si/Ge identification
- Tests diodes, SCR's, FET's, and Darlings
- CSA approved version available

The 520B with HI/LO Power Drive lets you test even more transistors and semiconductors in-circuit—with shunt resistances as low as 10 ohms and shunt capacitances up to 15 μ F. The 520B is fast, too. A complete test can take less than nine seconds. With the tester in LO drive, just connect the test clips in any order to the leads of the device to be tested. Move the test switch through its six positions until you hear a pulsating audio tone, which indicates a good semiconductor. All three leads are identified automatically.

If you don't get a tone, switch to HI drive and operate the test switch again. Now a tone indicates a good semiconductor and identifies the base or gate lead. Each transistor testing "good" also is identified as NPN or PNP. Leakage current measurements are performed on devices out-of-circuit. The device is automatically identified as germanium or silicon and acceptable leakage limits are indicated for each on the meter panel.

Since the 520B has only three panel controls, it is fast and easy to use. Anyone can use the 520B's high-speed technique to identify defective components in less time. No need to look up from your work—an audible "beep" signals a good transistor.

LIMITING IN-CIRCUIT BASE-EMITTER SHUNT VALUES FOR VALID TESTS—**Resistance:** Greater than 10 ohms. **Capacitance:** Less than 15 μ F.

GENERAL

Accessories: Color-coded test leads with Mini-Lock clips; detailed instruction manual; optional FP-5 Dynaflex® three-lead, one-hand probe for easy in-circuit testing available. **Power Required:** 105-125VAC, 50-60Hz; also available for 230VAC, 50-60Hz. **Size (HWD):** 20 cm x 17 cm x 8.9 cm (8" x 7" x 3.5"). **Weight:** 2.27 kg (5 lb.).

CSA approved version available.

Portable Transistor Tester



MODEL 510

- Fast GO/NO-GO in-circuit transistor testing
- Fast and thorough GOOD/BAD out-of-circuit testing
- Tests FET's and SCR's in-circuit or out-of-circuit
- Connect any test clip to any component lead
- Gives positive emitter-base-collector identification in LO drive—positive base identification in HI drive
- Light-Emitting Diodes indicate NPN-OK or PNP-OK
- Pocket-size—Over 100 hours of testing from single set of "AA" cells
- Digital stability—no adjustments; nothing to go out of calibration
- Includes carrying case and leads

FEATURES B&K-PRECISION'S EXCLUSIVE DYNAPEAK™ TEST WITH SELECTABLE HI-LO DRIVE FOR ACCURATE IN-CIRCUIT AND OUT-OF-CIRCUIT TRANSISTOR TESTING.

Model 510 uses our digital high current, low duty cycle pulse-testing technique to test semiconductors even with resistive and capacitive shunt impedances. In LO DRIVE, you get positive GOOD/BAD indication, polarity and identification of all three leads—in-circuit or out-of-circuit! HI DRIVE lets you test devices in-circuit even with low shunt impedances and get positive GOOD/BAD indication, device polarity, and identification of the base lead.

IT'S THIS EASY TO USE:

TEST IN LO DRIVE FIRST: In-circuit or out-of-circuit, clip the test leads (supplied) to the device in any order. Set the HI/LO Drive Switch to LO and rotate the TEST

switch. An NPN-OK or PNP-OK light is your positive assurance of a good device and its polarity. The position of the TEST

switch tells you which color-coded test lead is connected to base, collector, and emitter.



Test transistors as fast as you can turn the switch!

TEST IN HI DRIVE ONLY IF you don't get an OK light in LO. Set the HI/LO Drive Switch to HI and rotate the TEST switch. HI Drive allows devices to be tested safely in-circuit even with low shunt impedances. Here again, an NPN-OK or PNP-OK light is your positive indication of a good device and its polarity. You also know which lead is connected to the base from the color coding.

FET's and SCR's test just as easily in the same way.

SPECIFICATIONS

IN/OUT-OF-CIRCUIT TESTS:

GOOD/BAD test for transistors, FET's, SCR's, and Darolithons.

Identifies transistors as NPN or PNP.

FET as N-channel or P-channel.

Identifies FET gate lead.

Identifies all leads of transistors in LO drive; base lead in HI drive.

Identifies all leads of SCR.

APPLIED TEST CURRENTS:

Base Drive: 250mA (HI) or 1mA (LO) at 2% duty cycle.

Collector Drive: 125mA at 2% duty cycle.

Test Repetition Rate: 5Hz.

IN-CIRCUIT SHUNT LIMITS

FOR VALID GOOD/BAD TEST:

Resistance: Down to 10 ohms with HI drive; down to 1.5K ohms with LO drive.

Capacitance: Up to 25μF with HI drive; up to .3μF with LO drive.

Power Requirements: 6VDC from four "A" cells, not supplied. Standby current, 4mA; average testing current, 12mA.

Accessories: Carrying Case and test leads supplied. Model FP-5 Dynaflex Probe (optional) may be used in place of test leads.

Size (HWD): 4 x 9.5 x 17cm (1.75 x 3.75 x 6.6").

Weight: 1 lb. (0.45 kg)

Solid-State RF Signal Generators

MODEL E200D



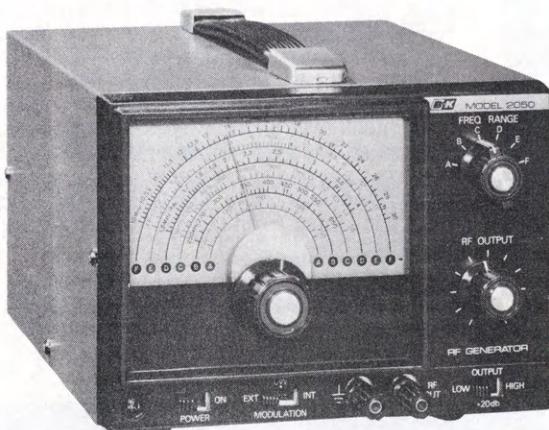
SPECIFICATIONS

Frequency Range: 100kHz-54MHz in 5 bands; 54/216MHz on harmonics. **Accuracy:** $\pm 1.5\%$ of highest frequency on any range used; better than 0.1% obtainable with crystal calibrator. **Output** (calibrated into 50Ω load): $100,000\mu\text{V}$ maximum. **Output Level Calibration Accuracy:** $\pm 1\text{dB}$ to 54MHz. **Attenuation:** 6 individually shielded step attenuators with total attenuation

- 100kHz to 54MHz coverage in 5 fundamental bands and harmonics to 216MHz
- Completely shielded RF output with modulation percent metering and variable monitored attenuation usable to less than $1\mu\text{V}$
- Built-in 100kHz and 1MHz crystal calibration system
- Easy-setting 2-color 5" anti-backlash vernier dial

Features 100% silicon transistor circuitry and zener-regulated power supply for accuracy, stability and long life. Six individually shielded step attenuators plus variable fine output level control with calibrated meter provide widest range of outputs with known signal levels. Double shielding eliminates spurious radiation even at outputs of $1\mu\text{V}$. Internal crystal calibrator has accuracy of better than 0.1%. Has $200\mu\text{A}$ d'Arsonval meter for accurate monitoring and setting of RF carrier and modulation levels. Crystal calibrator provides audible zero-beat through built-in speaker. Can be used as crystal-calibrated marker. Generates 100kHz to 54MHz on fundamentals and 54 to 216MHz on harmonics.

MODEL 2050



SPECIFICATIONS

Frequency Ranges: 100kHz to 30MHz on 6 fundamental bands. **Accuracy:** 1.5% of dial setting. **Output:** 0.1VRMS or better (20°C). **Attenuator:** Combination HIGH-LOW switch, plus continuously variable RF OUTPUT control for approximately 20dB change. **Modula-**

tion, Internal: 400Hz; 40%, $\pm 5\%$. Modulation, External: 40Hz to 10kHz; modulating voltage input, 1.5VRMS for 40% or better modulation. **Operating Temperature Range:** 0-50°C. **Power Requirements:** 105-125VAC, 50/60Hz (also available for 210-250VAC, 50-60Hz); 2.8W. 3-wire

- 100kHz to 30MHz in 6 bands, with 1.5% accuracy
- 3 outputs: RF, modulated RF (400Hz) and externally modulated RF
- Positive anti-backlash dial drive
- Zener-regulated power supply
- 100% solid-state
- FET's for stability

oscillator. Built-in detector, amplifier and speaker provided for calibration. **Power Requirements:** 105-130VAC, 50-60Hz; 6W. Also available for 210-260VAC, 50-60Hz. Three-wire grounded line cord. CSA approved version available. **Size (HWD):** 18 x 32 x 20cm (7.25" x 12.75" x 8"). **Weight:** 4.5kg. (10 lbs.).

Rugged, versatile, accurate RF signal generator is built to withstand the rigors of continuous industrial use, yet it's compact and lightweight—weights only 5 lb.

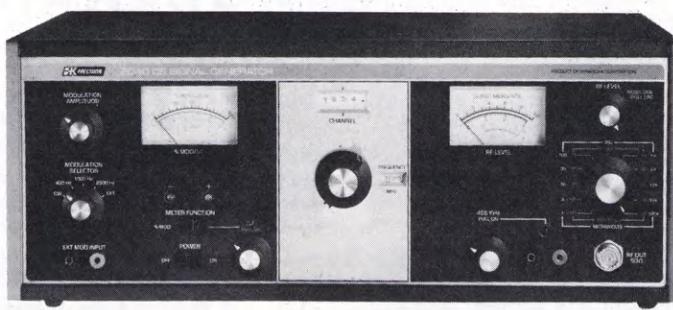
All solid-state silicon circuitry uses FET's in RF and audio oscillator stages for greater stability and maximum linearity of modulated signals. A single PC board holds 90% of components to provide highest frequency stability. Zener-regulated power supply is internally fuse-protected. Isolated RF output gives maximum protection against external voltage sources.

The 2050 is simple to operate and perfect for use in schools and training programs. A detailed instruction manual provides helpful applications information, as well as basic operating procedures.

grounded line cord. CSA approved version available. **Size (HWD):** 15 x 19 x 24cm (6.125" x 7.5" x 9.75"). **Weight:** 2.2kg. (5 lbs.). **Accessories:** Supplied with shielded leads with insulated clip and banana plug; detailed instruction manual.

40-Channel PLL CB Signal Generator

MODEL 2040



- Designed for use with all class D CB transceivers...AM and SSB.
- Covers all 40 channels plus ten additional channels.
- ± 5 parts per million accuracy guaranteed, ± 1 ppm typical.
- Delta frequency adjustment allows variation from channel center frequency for SSB performance tests and bandpass filter evaluation.
- Built-in EIA standard noise generator to check automatic noise limiters and noise blankers.
- Internal modulation frequencies of 400, 1000, and 2500 Hz.
- Crystal controlled 455 kHz IF. Output attenuator and vernier provide calibrated outputs from 100,000 μ V to 0.1 μ V.
- Double shielding eliminates spurious radiation.
- Ultra-stable...phase-locked loop circuitry and oven-controlled crystal assure stability.
- Performance compares to much more costly generators.

The B&K-PRECISION Model 2040 is a high performance signal generator, tailored to the very specific needs of the Citizens' Band radio industry. The most important signal generator parameters are frequency and output level calibration accuracy, and stability; in these areas the 2040 excels. Frequency calibration and stability are guaranteed accurate to ± 5 ppm (.0005%) after a short 15 minute warmup. Typical stability is ± 1 ppm. Phase-locked loop circuitry, referenced to a high accuracy oven-controlled crystal, and powered by a well regulated power supply, maintain performance standards under all normal operating conditions. When left plugged in, virtually no warm-up is required.

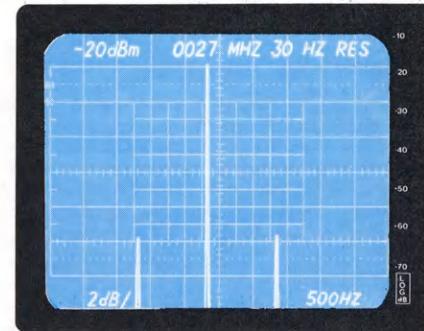
A microvolt output meter and calibrated attenuators combine to provide highly accurate generator output measurements, down to 0.1 μ V. The calibrated output attenuator provides output level adjustments from 1,000,000 μ V down to 1 μ V in 10 dB steps. A vernier control provides an additional adjustment range of +3 dB to less than -10 dB of level selected; down to as low as .1 μ V. Double shielding prevents signal radiation leakage from affecting output level calibration. An additional output, fixed at the standard 455 kHz IF frequency, is pro-

vided to aid in receiver troubleshooting and alignment. Accuracy is $\pm 0.1\%$. A front panel LED lights when the 455 kHz generator is turned on.

Both AM and SSB transceivers can be checked with equal ease using the 2040. For AM tests, modulation is provided at 400, 1000 or 2500 Hz. Modulation percentage is adjustable to 100%. Percentage of modulation is read directly on a calibrated meter scale. For SSB tests, the delta frequency adjustment (ΔF) allows small but precise frequency offsets from the channel center frequency to simulate upper and lower sideband signals.

An internal protection feature protects the 2040 from RF power if a transceiver under test is accidentally keyed. The generator will safely withstand an RF input of 5 watts at 27 MHz for 1 minute without component damage.

LAB-QUALITY PERFORMANCE



The output signal of every Model 2040 is examined on a spectrum analyzer, assuring a clean output. In the spectrum analyzer photo above, the generator under test was modulated at 1000Hz, as indicated by the sideband spacing.

SPECIFICATIONS

FREQUENCY COVERAGE

AM and ΔF : 50 channels, including the present 40 authorized CB channels. In addition, all intermediate unassigned frequencies are provided for convenience in performing adjacent channel measurements for all channels. **IF:** 455 kHz crystal-controlled output provided. Can be used independently of AM and ΔF functions.

FREQUENCY GENERATION SYSTEM

AM and ΔF : Programmable, crystal-controlled phase-locked loop (PLL) and 50-position selector switch. Selectable calibrated vernier function provides 0 ± 5 kHz deviation (ΔF) from any of the selected center frequencies. Crystal reference is oven-controlled. **IF:** Crystal controlled oscillator.

FREQUENCY ACCURACY AND STABILITY

AM: Better than ± 5 ppm (.0005%) at any frequency setting, after 15 minutes warm-up (± 1 ppm typical stability ± 2 ppm typical accuracy). Vernier offset (ΔF) accuracy $\pm 5\%$ of indicated reading. **IF:** $\pm 0.01\%$, 0-50°C.

OUTPUT LEVEL

AM and ΔF : 0.1 μ V to 100mV (calibrated for 50-ohm termination), selected in 10 dB increments to 1 μ V. Vernier control provides adjustment range of +3 dB to -10 dB of level selected, down to 0.1 μ V. **IF:** Continuously variable uncalibrated output level control.

OUTPUT LEVEL METERING

AM and ΔF : Front panel meter provides microvolt and dB readings.

OUTPUT CONNECTORS

AM and ΔF : UHF (SO-239). **IF:** Dual Banana Jacks.

MODULATION CHARACTERISTICS

AM: 0-100%, calibrated, continuously adjustable. Selectable CW, 400, 1000, 2500 Hz or external modulation. Percent modulation monitored on % MOD/ ΔF meter. **ΔF :** Simulated single tone SSB modulation of 0 to 5 kHz by using selectable calibrated vernier (ΔF) function. Magnitude of frequency deviation from carrier frequency monitored by % MOD/ ΔF meter. All modulation capability of AM mode applies. **IF:** Fixed 30%, $\pm 10\%$ modulation, when using 400, 1000, or 2500 Hz internal modulating frequencies. Percent modulation is not monitored on % MOD/ ΔF meter. Can be modulated with external signal with no provision for monitoring percent modulation.

MODULATION METERING

Front panel meter provides percent modulation indication. Metering applies to internal and external modulation (AM and ΔF only).

IMPULSE NOISE TEST

For receiver noise limiter and blanking tests, an

EIA Standard noise test signal generator is provided. **Pulse Width:** 1 microsecond. **Rise/Fall Time:** Less than 10 nanoseconds. **Repetition Rate:** 100 PPS. **Output Impedance:** 50 Ohms.

GENERATOR OUTPUT CIRCUIT PROTECTION:

The generator can withstand an RF input of 5 Watts at 27 MHz for 1 minute without component damage.

FRONT PANEL CONTROLS/FACILITIES:

RF Level/dBm Meter. RF Level (Carrier) Adjust; also acts as PULL ON control for Noise Generator. RF OUT 50 Ω Jack (Signal Generator Output). 455 kHz PULL ON control; also adjusts output level of 455 kHz. 455 kHz output jacks (banana type), 455 kHz-ON lamp; CHANNEL Selector Switch (50-position), % MOD/ ΔF Meter. METER FUNCTION switch (% MOD/ ΔF). ΔF control; pull on to select ΔF function. MODULATION AMPLITUDE Adjust. External Modulation Input Jacks (banana type). POWER ON-OFF Switch.

Power Requirements: 105 to 125 VAC 60Hz. 120/240 VAC 50/60Hz version available. 100 VAC 60Hz version available. CSA approved version available.

Dimensions: (HWD) 18 x 27 x 45 cm (7.3 x 10.6 x 17.9)

Weight: 7.7 kg (17 lbs.)

BK PRECISION

DYNASCAN

31

40-Channel CB Servicemaster

MODEL 1040



- Greatly simplifies all CB transceiver servicing
- Checks complete CB transceiver performance in minutes
- Checks AM and SSB transceivers, 23 or 40 channel
- No complex hookups or calculations required
- Test results displayed on direct reading meters
- Only one hookup required for all tests
- Eliminates need for special equipment
- Increases your CB service profit by saving you time

APPLICATIONS

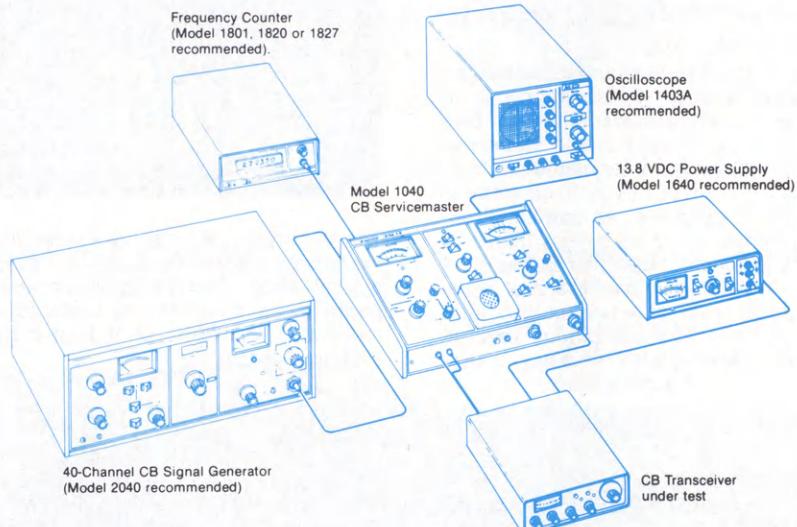
When used with a scope (like the Model 1403A) and signal generator (like the Model 2040) you can measure:

signal-to-noise ratio of CB receiver...audio output power...audio distortion...receiver sensitivity...AGC performance...effectiveness of CB noise limiter or blanker (when used with an impulse noise generator)...squelch threshold...adjacent channel rejection...transmitter AM power output—even mobile!...SSB power output with TRUE peakreading RF wattmeter...AM modulation...SSB modulation with a two-tone test—the only accurate way!...microphone sensitivity...Measure antenna SWR—even mobile!...Check the transceiver in the car...and more! Add a frequency counter (like the Model 1801, 1820 or 1827) and you can also safely measure transmitter output frequency.

FEATURES

Combination audio wattmeter/distortion meter/dB meter...Combination RF wattmeter/direct reading SWR meter...internal RF dummy load (50 watts continuous)...audio outputs for 1 kHz and two-tone test signals...Internal 10 watt audio load...monitor speaker/acoustic coupler (for test

The most complete "CB Test Bench" available!



SPECIFICATIONS

RF WATTMETER

Internal Load: 50-ohm, 50-watt continuous, 100-watt intermittent. **External Load:** Switch-selectable. **Ranges:** 0-10 watts, 0-50 watts, 0-100 watts. **Accuracy:** $\pm 5\%$. **Metering Selection:** Forward or reverse. Average or peak. **Frequency:** 27 MHz band. **SWR Scale:** 1:1 to 5:1 direct reading. **Insertion VSWR:** Less than 1.1:1. **Connector Type Input:** Standard antenna type SO239 (UHF); mates with PL-259 antenna plug. **External Load:** Standard antenna type SO239.

AUDIO WATTMETER

Load Impedance: Switch-selectable, 4, 8 or 16 ohms. **Load Rating:** 10 watts, continuous. **Ranges:** 0-100 milliwatts, 0-1 watt and 0-10 watts; auxiliary dB scale reads -20 dB to +3 dB. **Accuracy:** ± 0.5 dB from 30 Hz to 15 kHz. **Connector Type:** Banana plug receptacle.

DISTORTION MEASUREMENT

Type: Total harmonic distortion. **Scale:** 0-30% direct reading. **Accuracy:** $\pm 5\%$ of full scale. **Frequency:** 1 kHz, ± 100 Hz.

AUDIO SECTION

Outputs: Receiver audio, 1 kHz test tone. Twotone test signal. **Output Device:** Speaker or output jack. **Distortion:** Less than 3%, 2% typical. **Two-tone test Signal:** 500 and 2400 Hz two-tone. **Speaker:** Microphone modulation of transmitter; receiver test speaker. **Output Connector Type:** Banana jacks.

FREQUENCY COUNTER OUTPUT

Level: 50 millivolts minimum at 1 watt RF input, for direct reading of transmitter carrier frequency. **Impedance:** 10k ohms. **Connector Type:** BNC.

OSCILLOSCOPE OUTPUT

Transmit: 1MHz representation of 27 MHz carrier for display of modulation envelope on any scope. **Receive:** Displays audio output of receiver. **Impedance:** 10k ohms (transmit); 1k ohm (receive). **Connector Type:** BNC.

RF GENERATOR INPUT

Protection: In transmit mode, RF generator input automatically disconnects from transceiver antenna jack, on or off. **Impedance:** 50 ohms (nominal). **Connector Type:** BNC.

GENERAL

117 VAC, 60 Hz: 3 watts. **CSA Listed.** **13.8 VDC:** 150 milliamperes. Reverse polarity protection provided. **Size (HWD):** 10.2 x 34.3 x 27.9 cm (4 x 13.5 x 11"). **Weight:** 2.55 Kg (5 lb., 10 oz.) **Optional Interconnection Cables:** See page 47. **TR-200:** (optional) audio-isolation transformer.

The fastest way to check any CB transceiver!

tones)...117 VAC or 12VDC operation... complete control-center for connection of external RF signal generator, frequency counter, scope, CB transceiver, antenna system...all test equipment is protected from transmitter RF output...fail-safe 12VDC reverse polarity protection

The B&K-PRECISION Model 1040 takes all the difficulty out of CB transceiver servicing and makes complete performance measurements almost routine. In minutes you can check all operating characteristics of any CB transceiver—without changing any hookups! The CB Servicemaster functions as the heart of a high efficiency test center, designed to help you service transceivers in the shortest time possible. Because it is

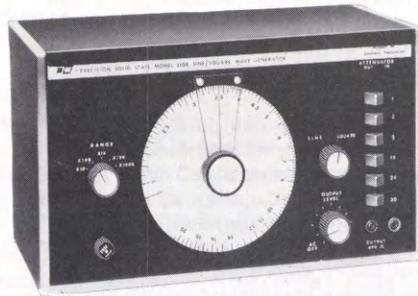
so easy to make complete performance tests, you'll be able to catch problems early, and avoid recalls later.

A built-in transmit mixer circuit samples a safe level of 27 MHz input signal and down converts it to approximately 1 MHz for scope display. This feature allows you to display the modulated RF signal on an oscilloscope with a bandwidth of only 2 MHz!

Convenient jacks are provided for all required connections. Since connections to external test equipment are made only once, your equipment will be protected from damage by accidental improper hookups. In addition, the RF signal generator cannot be accidentally damaged by keying

the transmitter. When the transmitter is keyed, the CB Servicemaster detects the signal and automatically disconnects the RF generator; and at the same time connects the transceiver RF output to the RF load and power measuring circuits.

For transmitter modulation testing, test tones can be injected into the transceiver or fed through the front panel acoustic coupler into the microphone. When an AM rig is being checked, a 1 kHz test tone is used; for an SSB rig, the 1040 generates a two-tone test signal (500 and 2400 Hz). When the two-tone test signal is fed to an SSB transceiver and its RF power is read on the peak reading wattmeter, power output measurements are highly accurate.



Sine/Square Wave Generators

MODEL E310B

- Extended frequency range—Sine: 20Hz to 2MHz; Square: 20Hz to 300kHz
- Constant-voltage output over each band and band-to-band
- 56dB step attenuation
- $\pm 2\%$ calibration accuracy
- 7VRMS output into high impedance loads

The industry standard for years! All solid-state circuitry uses FET's in oscillator, silicon transistors and zener-regulated power supply. Fully shielded—will not radiate to other equipment. Large, easy-to-read 5" vernier dial scale for accurate repeatability. Very fast square wave rise time makes the E310 well suited for evaluating audio amplifier performance. Detailed application notes on this procedure are included with the E310B.

SPECIFICATIONS

SINE WAVE FREQUENCY: 20Hz to 2.0MHz in five decade ranges. **Output:** 7VRMS into hi-Z loads; 0-6VRMS into 6000 Ω ; ± 2 dB. **Distortion:** 0.25% typical; 0.5% maximum (100Hz to 2MHz); 1% maximum 250 to 100Hz. **SQUARE WAVE FREQUENCY RANGE:** 20Hz to 200kHz in four decade ranges. **Rise Time:** Less than 100nSEC at 20kHz. **Output:** 0-10V

p-p (nominal). **Symmetry:** Balanced within 5% or less. **GENERAL:** **Frequency Calibration Accuracy:** $\pm 2\%$, 20 Hz to 2MHz. **Attenuators** (both sine and square wave): Six switches for a total of 56dB; accuracy, $\pm 5\%$ when terminated in a 600 Ω load. Continuously variable control adjusts output from maximum set by switches down to less than

0.25mV. **Power Requirements:** 105-130VAC, 50-60Hz; 15W. Also available for 210-260VAC, 50-60Hz. CSA listed version available. **Size (HWD):** 18 x 32 x 20cm (7.25 x 12.75 x 8"). **Weight:** 4.5 kg. (9.5 lbs.).



MODEL 3050

- Sine/square waves, 20Hz-200kHz
- Synchronizing input terminal
- High stability, even with line voltage changes
- 10VRMS output, 0-40dB attenuation
- Each band position uses entire scale
- Tests ultrasonic controls

This versatile audio frequency generator, based on the Wien bridge oscillator circuit, provides sine wave output voltage of 10VRMS over its entire frequency range of 20Hz to 200kHz. An ideal signal source for phase and time measurements and for characteristic measurements using square waves, as well as a low-distortion signal source for audio frequency measurements. Factory set for 105-125VAC, 50-60Hz, but easily converted to 100V or 210-250V 50-60Hz operation.

SPECIFICATIONS

FREQUENCY RANGE (sine and square wave): 20Hz-200kHz in four decades. **Accuracy:** $\pm (3\% + 2\text{Hz})$. **SINE WAVE OUTPUT:** 10VRMS, $\pm 10\%$ at 1kHz. **Output vs. Frequency Characteristics** (referred to 1kHz level): ± 1 dB or better from 20Hz to 200kHz. **Distortion:** 0.5% or less, 50Hz-100kHz; 1% or less, 20Hz-200kHz. **SQUARE WAVE OUTPUT VOLTAGE:** 10V p-p or more. **Tilt:** 10% or less at 20Hz. **Rise and Fall Times:** 500nSEC or less. **Overshoot:** 3% or less. **Symmetry:** Within $\pm 5\%$ measured at 1kHz with maximum output. **GENERAL:** **Output** (sine and square wave): 0/20/40dB step attenuator plus continuously variable OUTPUT vernier control that adjusts output from zero to maximum selected by step attenuator. Approx. 600 Ω output impedance. **External Synchronization:** Range, typically 1.5%V; 3VRMS maximum input. Input impedance approximately 20,000 Ω . **Stability with $\pm 10\%$ Line Voltage Variation:** Less than $\pm 0.5\%$ frequency

drift; less than ± 0.5 dB output level variation. **Power Requirements:** 117VAC, 50-60 Hz; also available for 230VAC; 30W. CSA listed version available. **Size (HWD):** 15 x 19 x 24 cm (6 x 7.75 x 9.625"). **Weight:** 2.8kg (6.25 lbs.). **Accessories:** Complete with one red and one black test lead, each terminated in insulated alligator clip and banana plug, spare fuse.

New Sweep/Function Generator



AVAILABLE FALL '78

MODEL 3020

- Four instruments in one package—sweep generator, function generator, pulse generator, tone-burst generator
- Covers 0.02Hz-2MHz
- 1000:1 tuning range
- Low-distortion high-accuracy outputs
- Three-step attenuator plus vernier control
- Internal linear and log sweeps
- Tone-burst output is front-panel or externally programmable

APPLICATIONS

Frequency response tests...Amplifier overload characteristic measurements...Amplifier square-wave and sweep evaluation...Amplifier tone-control evaluation...Tone-burst speaker response tests...Bias signal source...Substitute signal source for digital and analog circuits...Pulse signal source...Check threshold levels for TTL and CMOS logic...Receiver alignment...IF response tests...Observe distortion including Transient Intermodulation (TIM) distortion...Measure linearity of oscilloscopes, chart recorders and servo systems...Check resonant circuits for ringing inductors...Align subaudible and tone-burst decoders...Evaluate power supply filter networks...Generate double side-band suppressed carrier signals for communications system tests...Evaluate attack-time of audio compressors...Sweep-test any passive or active device up to 2MHz.

The new Model 3020 is the most versatile signal source ever offered by B&K-PRECISION. This one instrument can actually replace a function generator, sweep generator, pulse generator and tone-burst generator. Frequency coverage spans 0.02Hz to 2MHz in seven ranges, with each range providing linear 1000:1 frequency

control. Operating frequency can be varied on each range by the front panel frequency control or the VCO external input.

By utilizing the variable symmetry control, the duty cycle of any waveform can be changed over a 40:1 range. In this manner, almost any wave shape can be duplicated. The square-wave output can be shaped to generate rectangular waves or pulses, the triangle wave can be transformed into a sawtooth or ramp and sine-wave distortion can be simulated. All waveform types can be inverted.

The 3020 is ideally suited for measuring the frequency response of audio components and systems by using the sweep mode. The linear or log sweeps may be selected, and the range, width and rate may be varied as desired. The audio response of amplifiers, preamplifiers, tape recorders and other accessories can be quickly determined. The bias setting of a tape deck can be set for a maximum frequency response when the 3020 is used as a signal source. The internal sweep voltages are available at a rear panel jack, for driving a recorder or oscilloscope.

The tone-burst generation capability allows the 3020 to be used as a signal source for speaker tone-burst tests, TIM distortion tests, tone-burst decoder alignment and

many other applications. The duration of the tone-burst may be selected by the front panel burst gate control or the duration of the burst can be very accurately programmed using an external TTL signal of known length.

Internal amplitude modulation capability with front panel controls permits the output signal to be modulated by a 0 to 1.5 volt external source. Modulation is variable to 100% and can be independently controlled from the output carrier level. Both may be controlled by adjusting the output amplitude setting. This feature is useful to provide amplitude modulated test signals or an FM signal with an AM component (to determine AM rejection of a discriminator or limitor circuit). By turning down the carrier level while the modulation level is left constant, a double sideband suppressed carrier test signal can be generated.

The 3020 features the same variable DC offset capability found on the 3010. Up to ± 5 VDC (into 50Ω) combined with the selected audio output frequency can be added. Variable DC offset has a number of diverse engineering applications, as described on page 35. Output attenuation can be varied with three pushbuttons and vernier control from 0 to -60 dB.

SPECIFICATIONS

FREQUENCY CHARACTERISTICS

Range: .02 Hz to 2MHz in 7 ranges. (Each range provides 1000:1 frequency control.) **External Control** (rear panel input): VCO range greater than 1000:1 (linear) on any frequency range. (With dial setting at .002, a 0 to 10.0V input ramp produces a frequency change of 1000:1.) **Accuracy:** $\pm 5\%$ of full scale on all ranges. (Calibrated at full scale.) **Stability:** .05% (after 15 min.) **FUNCTIONS:** Sine, Triangle, Square, TTL Square Wave, Pulse, Tone Burst. **SQUARE WAVE:** Variable amplitude and fixed TTL output. **Symmetry:** 99% to 100kHz. **Rise/Fall Time:** <100ns at maximum output. **TTL Square Wave Response:** <25ns rise/fall time (logic 0<0.4V; logic 1>2.4V). **SINE WAVE:** Variable amplitude. **Distortion:** <1% .02 Hz to 100kHz, <0.5% typical. **Amplitude Flatness:** Better than ± 0.3 dB to 2MHz at maximum output amplitude. **TRIANGLE WAVE:** Variable amplitude. **Linearity:**

99% at 100 kHz. **Variable Symmetry:** 40:1 range, independent of frequency. Controls all output waveforms, including TTL. **AM Modulation:** 0-1.5V p-p external signal required to provide 100% modulation; continuously variable. Capable of suppressed carrier operation.

SWEEP CHARACTERISTICS

Internal: Linear or log. **Sweep Rate:** 0.5Hz (2 SEC period) to 50Hz (20ms period). **Sweep Width:** Variable from 10:1 to 1000:1. **Sweep Voltage Output:** Proportional to sweep; at rear GCV connector. **External Sweep:** Rear panel VCO input provided.

TONE-BURST CHARACTERISTICS

Burst Width: Adjustable from 5-90% of period of internal gating frequency. External gating, burst width determined by TTL gating pulse. **Repetition Rate:** 0.5Hz (2 SEC period), to 50Hz (20ms period) set by SWEEP RATE control.

OUTPUT

Amplitude: 20Vp-p open circuit; 10Vp-p into 50Ω . **Control:** Continuously variable, >20 dB. Fixed attenuation, 0-40dB in 3 steps. This, together with 20dB variable, provides 60dB total attenuation. **Impedance:** $50\Omega \pm 5\%$. **D.C. Offset:** Continuously variable, maximum of ± 10 V open circuit or ± 5 V into 50Ω . (Maximum AC peak + VDC offset without clipping is ± 20 V open circuit; ± 10 V into Ω .)

GENERAL

Rear Panel Jacks: (All phono) VCO (sweep) input, GCV voltage out (proportional to frequency), AM input, TTL output, tone-burst control external input. **Operating Environment:** 0-50°C (Accuracy specified at 25°C ± 5 °C.) **Power Requirements:** 105-130VAC, 60Hz, 22W. Three-wire cord. **Size (HWD):** 8.1 x 29 x 20cm (3.2 x 11.3 x .5") including handle at rest position. **Weight:** 1.35kg (3.1 lbs.) CSA listed.

New Low Distortion Function Generator



MODEL 3010

- Generates sine, square and triangle waveforms
- Variable amplitude and fixed TTL square-wave outputs
- 0.1 Hz to 1MHz in six ranges
- Push button range and function selection
- Typical sine wave distortion under 0.5% from 0.1 Hz to 100 kHz
- Variable DC offset for engineering applications
- VCO external input for sweep-frequency tests

APPLICATIONS

Frequency response tests...Amplifier overload characteristics...Amplifier square-wave evaluation...Amplifier tone-control evaluation...Speaker response tests...Bias signal source...Substitute signal source for digital and analog circuits...Check threshold levels for TTL and CMOS logic...Receiver alignment...IF response tests...Measure linearity of oscilloscopes...Chart recorders and servo systems...Check resonant circuits for ringing inductors...Evaluate power supply filter networks.

B&K-PRECISION's new model 3010 function generator offers convenience and excellent waveform accuracy at an affordable price. Frequency coverage is unusually wide, spanning 0.1 Hz to 1 MHz in six ranges, with each range providing linear 100:1 frequency control.

Push-button range and function selection provides fast, error-free operation. The stable voltage-controlled oscillator (VCO) of the 3010 is varied on each range by the front panel FREQUENCY control, or the

VCO external input. A 0 to 5.5v ramp applied to the VCO external input will provide a 100:1 output frequency change. By applying such an input ramp, the 3010 can be used as a sweep generator for response measurements in audio and I-F circuits. When an audio signal is applied in place of a ramp, the 3010 will produce a direct FM output.

The 3010 features a variable DC offset control which provides up to ± 5 VDC (into 600Ω) combined with the selected audio output frequency. Engineering applications for this feature include evaluation of the effects of: DC bias on an AC circuit, an audio transformer approaching saturation and shifted operating points of a DC coupled amplifier. The DC offset function can even be used to simulate a DC power supply for the evaluation of power supply filter networks. When used in this manner, the 3010 output can be tuned to simulate the line frequency input of the "model" power supply.

For square-wave operation, the 3010 offers a fixed TTL output level and a variable

amplitude output. Variable output square wave rise or fall time is 100 nanoseconds or less; TTL square wave rise/fall time is 25 nanoseconds or less. Square-wave symmetry at 100 kHz is a near-perfect 99%. In addition to response tests, the square-wave outputs are ideal for clock-pulse substitution in digital circuits.

The triangle-wave function is always useful when linearity tests are required. Small amounts of distortion indicated by non-linear changes in a waveform are easier to detect on a triangle wave than on other common waveforms. For that reason, triangle-wave linearity is a highly important specification. Again, the 3010 generates a near-perfect output by providing 99% triangle-wave linearity at 100 kHz.

As a sine-wave generator, the 3010 is conservatively rated at less than 1% distortion from 0.1 Hz to 100 kHz; less than 0.5% is typical. Above 100 kHz, harmonics are suppressed by over 30 dB at maximum output amplitude.

SPECIFICATIONS

FREQUENCY CHARACTERISTICS—

Range: 0.1Hz to 1MHz in six ranges. (Each range provides >100:1 frequency control.)

External Control (rear panel input): VCO \geq 100:1 (linear) on any frequency range. (With dial setting at .1, a 0 to 5.5V input ramp produces a frequency change of 100:1.)

Accuracy: 5% of full scale on all ranges. (Calibrated at full scale.)

Stability: .05% (after 15 min.)

FUNCTIONS: Sine, Triangle, Square, TTL Square wave.

SQUARE WAVE: Variable amplitude or fixed TTL output.

Symmetry: 99% to 100kHz.

Distortion: <1% 0.1Hz to 100kHz; <0.5% typical.

Rise/Fall Time: <100ns at maximum output.

TTL Square Wave Response: <25ns rise/fall time (0 < .4V:1 > 2.4V).

SINE WAVE: Variable amplitude.

Amplitude Flatness: <.3dB to 1MHz at maximum output amplitude.

TRIANGLE WAVE: Variable amplitude.

Linearity: 99% at 100kHz.

OUTPUT—

Amplitude: 20Vp-p open circuit 10Vp-p into 600Ω .

Control: Continuously variable, >30dB range.

Impedance: $600\Omega \pm 5\%$.

D.C. Offset: Continuously variable, maximum of ± 10 V open circuit or ± 5 V into 600Ω . (Maximum VAC + VDC offset without clipping is ± 10 V open circuit; ± 5 V into 600Ω .)

GENERAL—

Operating Environment: 0-50°C (accuracy specified at 25°C ± 5 °C.)

Power Requirements: 105-130VAC, 60Hz, 8W. Three-wire cord.

Size (HWD): 8.1 x 29 x 20cm (3.2 x 11.3 x 5") including handle at rest position.

Weight: 1.3kg (2.9lbs). CSA listed.

New Multiple-Output Lab Power Supply



Model

1650

AVAILABLE FALL '78

- Functions as three separate power supplies
- 5VDC, 5A fixed output
- Two separate 0 to 25VDC outputs at 0.5A
- Fully automatic, current-limited overload protection
- Unique tracking circuit allows automatic tracking of variable DC outputs
- + and - terminals of each output are fully isolated, even when in automatic tracking mode
- All three outputs may be connected in series or parallel for higher voltage or current requirements

APPLICATIONS

Power digital logic circuits...Solid-state engineering work...Industrial production testing...Engineering labs...Student labs...Service applications...Experimenters and hobbyists.

FEATURES

Three individual outputs...Opto-isolator controlled tracking circuit...Load regulation better than 0.1% from no-load to full-load on 25V outputs...All three outputs are current limited and short-circuit protected...Large meter for easy voltage and current measurements.

Our new Model 1650 tri-output power supply was designed for modern solid-state applications where both linear and digital circuits are encountered. In one package, this unit combines the features of a separate 5VDC fixed-output supply and two 0-25VDC variable supplies. The 5 volt output is rated at 5 amps, to satisfy power requirements of complex digital devices.

The two 0-25VDC A and B outputs feature excellent load regulation and infinitely variable voltage control. By selecting the TRACK mode, the B variable output can be set to track the voltage control of the A output. For example, if the B output control is set at 100%, the voltage selected with the A control will appear at both the A and B

outputs. If the B control is set to a 50% position, the B output will be 50% of the voltage at the A output. For example, if 10 volts was set with the A output control, the B output (when set at 50%) would be 5 volts. Complete electrical isolation of both supplies can be maintained when in the tracking mode, if so desired. When the INDEPENDENT mode is selected, both A and B outputs are individually controlled.

The tracking feature can also be used to provide + and - voltages for operational amplifier circuits. If additional voltage or current requirements exist, the A and B supply outputs can be connected in series or parallel. When connected in this manner, the automatic tracking circuit provides equal control of both outputs with one adjustment.

The 1650 features automatic current limiting and short-circuit protection on all ranges and outputs. Integrated circuit control and logic circuits maintain the highest reliability and stability. All power outputs use color-coded heavy-duty 6-way binding posts.

SPECIFICATIONS

Input Voltage: 105-125VAC, 60Hz. Output Voltages

— 5 Volt Supply: 5 volts DC $\pm 5\%$. A Supply: 0 to 25VDC. B Supply: 0 to 25VDC. OUTPUT CURRENT

— 5 Volt Supply: 5 A maximum; A & B Supplies: 0.5A current limited.

REGULATION

Load: Less than 0.1% (25mV) variation from no-load to full-load on 25V supplies. Less than 3% (150mV) variation from 10 m.A. to 5A change in load current on 5-volt supply. **Line:** Less than 0.2% (50mV) for a line voltage change of 20-volts on 25V supplies. Less than 0.4% (20mV) for a line voltage change of 20 volts on 5 V supply.

NOISE RIPPLE

All supplies: Less than 5mV RMS. (not applicable to "A" in track mode).

GENERAL

Current limiting: Limiting for each 0-25V supply fixed slightly above rated current for short-circuit protection. The 0-5V supply has automatic fold-back to 2.5@ short-circuit. **Series Operation:** All three supplies may be connected in series. **Parallel Operation:** 25V supplies may be connected in parallel by adding suitable current-equalizing resistors. **Volts/Current Meter Accuracy:** $\pm 5\%$ of

F.S. Meter ranges: Voltages, 0-25 and 0-5.5. Current, 0-0.5A, 0-5A. **Tracking (0-25V Supplies):** "B" Supply Tracks "A" supply at a fixed or selected ratio. Applies whether the supplies are connected in series, back-to-back or are completely isolated.

Tracking Error: $\pm 1\%$ of rated voltage ($\pm 250\text{mV}$) when both supplies are operating in the range of 2 to 22 volts. **Tracking range:** The tracking error limits apply within the 2 to 22 volt range. Tracking is obtained outside these limits with increased error. **Size (HWD):** 3.9 x 14.1 x 10cm (3.88 x 14.13 x 10"). **Weight:** 22 lbs. CSA listed.

Laboratory Power Supplies



Protects equipment, user and itself!

APPLICATIONS

Industrial production testing . . . Engineering labs . . . Student labs . . . Service benches . . . Experimenters and hobbyists.

FEATURES

Fail-safe automatic overload protection, instantly resettable . . . Single pushbutton for current limit setting and resetting after overload . . . No short circuit required to set current limit . . . Continuously variable output voltage . . . Standby switch disconnects load for safe, quick adjustment without disturbing voltage or current settings . . . Combination on-off/voltage output and separate standby controls assure zero output voltage when power supply is first turned on.

Both of these highly versatile B&K-Precision power supplies have features that make them ideal for efficient use in schools, labs, service shops and industry. Whenever output current exceeds the adjustable preset level, the power supply automatically shuts down, both the ammeter and voltmeter go to zero and the front-panel overload indicator lights up. After the cause of the overload is cleared, pushing the CURRENT LIMIT button restores the power supply to operation at the preset levels.

Voltage and current are displayed directly on large front panel meters. The large voltage control knob permits setting the output to precise levels quickly and easily, making performance evaluation of units over wide test voltage ranges very convenient.

SPECIFICATIONS

1601

Input Voltage: 105-125VAC, 60Hz. 210-250VAC, 50/60Hz version available.

Output Voltage: 0-50VDC, continuously variable; two meter ranges, 0-25 and 0-50VDC.

Output Current: 0-2A in four ranges—0-50mA, 0-0.2A, 0-0.5A, 0-2A.

Load Regulation: Minimum, 0.05%; maximum, 0.1%; typical, 0.07%.

Line Regulation: 0.02% typical from 105 to 125VAC with output of 50VDC and 2A.

Ripple: 5mV peak-to-peak.

Temperature Coefficient: .002% of output voltage per °C at 50 volts.

Size (HWD): 3.88 x 14.13 x 10". **Weight:** 11 lb. CSA approved.

1602

Input Voltage: 105-125VAC, 60Hz.

Output Voltage: 0-400VDC, continuously variable.

Output Current: 0-200mA.

Load Regulation: 0.1%.

Line Regulation: 0.1% for 105-125VAC line.

Noise and Ripple: Less than 10mV peak-to-peak.

Protection: 0-200mA adjustable shutdown.

BIAS SUPPLY (100VDC):

Output Voltage: 0 to -100VDC continuously variable, floating.

Output Current: 0-2mA.

Load Regulation: 1%.

Line Regulation: 1%.

Noise and Ripple: Less than 10mV peak-to-peak.

Protection: Current-limiting resistance.

12.6 AND 6.3VAC (NON-ADJUSTABLE):

Output Voltage: 12.6 or 6.3VAC ±5% no-load, floating.

Output Current: 3.5A continuous.

Protection: Thermal circuit breaker on front panel.

Size (HWD): 3.9 x 14.1 x 10cm (3.88 x 14.13 x 10").

Weight: 5 kg. (11 lbs.).

CSA approved.

MODEL 1601

- Isolated 0-50VDC, continuously variable; 0-2A in four ranges
- Fully automatic shutdown, adjustable current limit
- Perfect for solid state servicing

MODEL 1602

- 0-400VDC, 0-200mA, continuously variable,
- 0 to -100VDC, 0-100VDC, 0-2mA and 12.6/6.3 VAC at 3.5A
- Fully automatic shutdown, adjustable current limit

Both the 1601 and 1602 use integrated circuits in control and logic circuits to maintain the highest reliability and stability. The color-coded heavy-duty output terminals are captive six-way binding posts, permitting floating output independent of chassis ground, or referencing either positive or negative output to chassis ground.

PRESETTING CURRENT LIMIT IS THIS EASY . . .

Push down and hold in the CURRENT LIMIT button and adjust the FINE knob (on 1601) or the SET knob (on 1602) until the ammeter reads the desired current limit. There's never a need to apply a short circuit to the output terminals or disconnect the load.

Mobile Equipment Power Supply



MODEL 1640

- Regulated adjustable output from 11-15VDC, 0-3A
- Fully automatic overload protection, manual reset, 5A surge limit
- Perfect for servicing CB radios and all other 12 volt mobile equipment

This B&K-PRECISION power supply has features that make it ideal for servicing mobile equipment. Output voltage is adjustable from 11 to 15 VDC and clearly readable on one expanded meter scale. The EIA Standard Automotive Voltage reference level of 13.8 VDC is highlighted in red on the meter scale. Unlike multiple range power supplies, there is no danger of accidentally selecting a higher voltage range and damaging equipment.

APPLICATIONS

Citizens' Band transceivers...Auto tape decks...Auto radios...FM converters...Electronic ignitions.

FEATURES

Fail-safe automatic overload protection, instantly resettable...Excellent regulation...Continuously variable output voltage from 11 to 15 VDC...+ and - voltage outputs...Illuminated meter displays voltage or current...L.E.D. overload indicator.

SPECIFICATIONS

Input Voltage: 105-125 VAC, 60 Hz. 210-250 VAC, 50/60 Hz version available. **Output Voltage:** 11-15VDC, continuously variable. **Output Current:** 0-3A continuous, 5A surge limited. **Meter:** Voltmeter-ammeter, pivot and jewel move-

ment (illuminated). Metering function selected by switch. **Overload Indicator:** L.E.D. glows after overload; turns off when overload is cleared. **Ripple:** Less than 8mV RMS; 0-3A. **Load Regulation:** Less than 0.8% voltage change from 0-3A, 11V to 15V. **Line Regulation:** Less than 0.8% voltage

The 1640 supplies a continuous output of up to 3 amps, with surge limiting at 5 amps. Should output current exceed the power supply's limits, power automatically shuts down and the front panel L.E.D. OVERLOAD indicator lights. After you've cleared the source of overload, just flip the ON-OFF/RESET switch to off—then on, and the power supply operation is restored to normal.

Superb regulation and high output current, make the 1640 well suited for use with CB transceivers and auto tape decks. This combination maintains a constant supply voltage, even while you're peaking the RF output of a CB transceiver. Well regulated supply voltage to tape decks is also important to prevent false motor speed variation problems from slowing down your servicing.

Either voltage or current can be selected by a front panel VOLTS-AMPS switch for display on the front panel meter. Because of the excellent regulation of the 1640, in practice, after the desired output voltage has been set, the VOLTS/AMPS switch may be left in the AMPS position. This procedure simplifies use and allows you to constantly monitor current variations.

change at 3A output \pm 10% line variation. **Short Circuit Protection:** Voltage shutdown, manual reset. Surge current limited to 5A maximum. **Size (HWD):** 7.8 x 25 x 22 cm (3-1/16 x 10 x 8-1/2"). **Weight:** 3.6 kg (8 lb). CSA approved.

New CB Test Bench Rack Mount Kit



MODEL RM-40

- Holds a complete CB test bench in one compact rack
- Conveniently contains the CB Servicemaster, CB Signal Generator, Frequency Counter, Oscilloscope and Mobile Power Supply
- Conserves bench space
- Complete with all hardware and easy instructions

Now you can build the most complete CB test system available into one space-saving unit. The new Model RM-40 Rack Mount Kit is designed to hold the Model 1040 CB Servicemaster, Model 2040 40-Channel PLL CB Signal Generator, Model 1801 40MHz Frequency Counter, Model 1403A Oscilloscope and the Model 1640 Mobile Equipment Power Supply.

This rugged kit includes a free-standing rack, rack panels, hardware and detailed assemble instructions. For more information on the complete B&K-PRECISION CB Test Bench, refer to pages 31-33.

Solid-State Sweep/Marker Generator



Pattern polarity and sweep reversal enable you to match waveform displays shown in manufacturers' alignment procedures.

Visual reproduction on front panel of ideal alignment curves, with lights indicating marker positions, provides a constant reference—minimizing errors.

Three built-in bias supplies are provided, with reversible polarity—more than adequate for all alignment tasks. Built-in 400Hz modulated markers.

Transistorized power supply regulators (zener-diode referenced) assure maximum stability and minimum drift.

After initial hookup to TV set, IF and chroma response curves can be observed without additional intercabling changes. All intercabling changes and generator selections are accomplished internally with the master FUNCTION switch and other front panel controls.

True post-injection of 10 crystal-controlled IF markers, plus an 11th oscillator circuit less crystal, as a user option for marker function in the 30-50MHz range.

A continuous chain of 100kHz markers can be superimposed on any of the crystal-controlled markers. Simplifies alignment of FM receiver IF stages and discriminators as well as AFC circuits of TV sets.

The highly popular Model 415 Sweep/Marker Generator concentrates all the TV alignment tools you ever will need (except

for oscilloscope and VTVM), into a single, versatile, easy-to-use instrument. Functional grouping of all controls and features adds greatly to the 415's efficient, easy use. When you use the unique 415 alignment procedures, you quickly develop a feeling of confidence in the unit and its operation. You achieve unparalleled speed in both alignment and verification of alignment.

The 415 eliminates the problems normally encountered in sweep alignment. It provides IF sweep, RF sweep on TV channels 4 and 10, video sweep, 10.7MHz sweep for aligning FM receivers and 10 crystal-controlled post-injection markers for accurate frequency identification on all sweep ranges.

The Instruction Manual has 100 comprehensive pages to serve as a reference for all aspects of alignment procedures. It also reviews, in clear language with many large drawings, the transmitted television signal, the television receiver, typical receiver block diagrams and the various tuned circuits which require alignment. There's also a quick, easy step-by-step setup chart.

COMPLETE ACCESSORY PACK

The 415 is supplied complete with the following accessories: RF cable with built-in DC blocking and switch-selectable 75 or 300Ω termination; PR-151 Demodulator Probe for all video, chroma, IF and RF demodulation needs; cables—one DIRECT

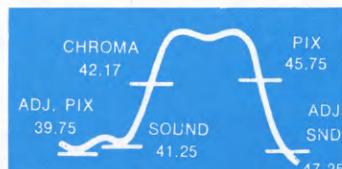
MODEL 415 4 instruments in one

- Sweep Generator
- Marker Generator
- Marker Adder
- Bias Supply

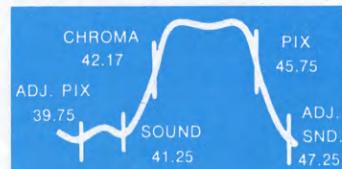
with mike connector, 10K isolating resistor and alligator clips; two with connector at one end, banana plugs at other end; three bias leads; one ground cable; two IF loading blocks.

EXCLUSIVE MARKER TILT FEATURE

This permits a marker to be viewed on your scope in either vertical or horizontal position at the flip of a switch for extreme accuracy when setting markers at the exact locations on the bandpass curve. Extremely useful when aligning traps, permits you to locate trap frequencies that occur close to the base line of the IF curve.



Markers Tilted Horizontally



Vertical Markers

RF EQUIVALENTS OF MARKERS

All IF and chroma markers are available on Channels 4 and 10.

BIAS SUPPLIES (3)

All three are low-impedance for solid-state, hybrid or all-tube sets. Two 0-25VDC Supplies: Reversible polarity. One 0-50VDC Supply: Reversible polarity.

GENERAL

Power Required: 105-125VAC, 50/60Hz, 25W; also available for 210-250VAC; three-wire line cord. CSA approved version available. **Size (HWD):** 23 x 44 x 27 cm (9 x 17.6 x 10.6). **Weight:** 9.5 kg. (21 lbs.)

SPECIFICATIONS

OUTPUTS

Video Sweep: 0-6MHz. **IF Sweep:** 35-50MHz. **Unmodulated Markers.** **Modulated Markers.** **Channel 4 RF Sweep.** **Channel 10 RF Sweep.** **10.7MHz Sweep.**

SWEEP WIDTHS

RF/IF: 1MHz to over 10MHz. **10.7MHz:** 100kHz-2MHz.

OUTPUT IMPEDANCES

72 ohms. 300 ohms.

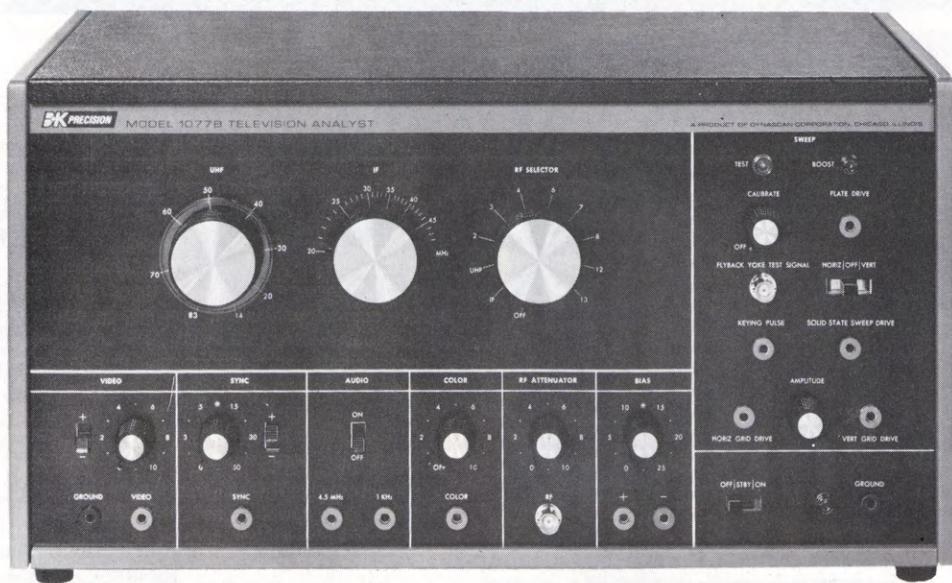
IF MARKERS (CRYSTAL-CONTROLLED)

39.75MHz: Adjacent channel pix trap. **41.25MHz:**

Sound trap. **41.67MHz:** IF chroma sideband carrier. **42.17MHz:** Chroma subcarrier. **42.67MHz:** IF chroma sideband carrier. **42.75MHz:** IF tuner link. **44.00MHz:** IF center frequency. **45.00MHz:** IF frequency. **45.75MHz:** Pix carrier. **47.25MHz:** Adjacent channel sound trap. **Extra Marker Oscillator** for user's option; accepts crystal in 30-50 MHz range. **External Marker Input Provision.**

100kHz MARKERS

Continuous string of markers with 100kHz separations; for superimposing on any IF marker during FM and AFT alignment.



APPLICATIONS

Uses signal substitution to check every stage of black-and-white or color TV's from antenna input to CRT grid . . . Check flyback transformers, horizontal deflection yokes and width coils for shorted turns . . . Check set's bandwidth, resolution, shading and contrast capabilities . . . Check frequency response . . . Adjust linearity . . . Check for low-frequency phase shift . . . Check CATV and MATV performance . . . Use as transmitter for video paging system in closed-circuit installations . . . Display ad cards in cable systems . . . Use as stable signal source to locate intermittents

FEATURES

Provides signal substitution for the entire range of signals present in any TV set, black-and-white or color . . . Horizontal and vertical drive for solid state and tube type circuits . . . Audio output . . . Built-in scanner for test-pattern slides (supplied) or any 3 x 4" positive transparency . . . B+ boost indication . . . High-voltage indication . . . 0-25VDC positive or negative bias supply from completely isolated low-impedance power supply . . . Three convergence patterns

MODEL 1077B

- Cuts troubleshooting time in half
- Drives solid-state sweeps
- Eight VHF channels
- All UHF channels 14-83
- 20-48MHz IF
- Audio, video, sync outputs

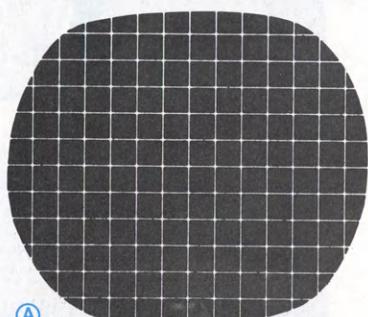
The B&K-Precision Model 1077B continues to be the most versatile TV service instrument available. Why? Because there's no better way to pinpoint the exact stage where the trouble is than by *direct signal substitution*. If the injected signal restores operation, you know the problem is somewhere between the injection point and the antenna—and if it doesn't, you know the trouble lies between the injection point and the picture tube or speaker. By checking successive stages, you can very quickly narrow down the problem to a single stage and soon to a single component.

The heart of the 1077B is its scanner, which modulates the RF and IF generators. Using the test pattern slide supplied, it's easy to check for many common problems in the receiver—see the box at the bottom of this page for a few examples. Other pattern slides are provided as well, and you can display any 3 x 4" positive transparency of your own if you wish.

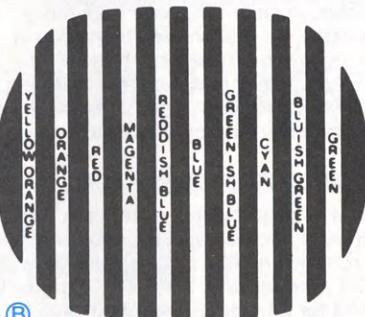
Because the 1077B's scanner can reproduce your own slides, it can also be used in closed-circuit TV systems for video paging or your sales floor display promotions—just replace the test pattern slide with your own appropriate slide and it will appear on the TV screen.

The 1077B can be used to check the performance of community and master antenna systems and for presentation of display card commercials.

PLUS THESE STABLE COLOR TV TEST PATTERNS:



(A)



(B)

(A) CROSSHATCH SLIDE—Used to check dynamic convergence.

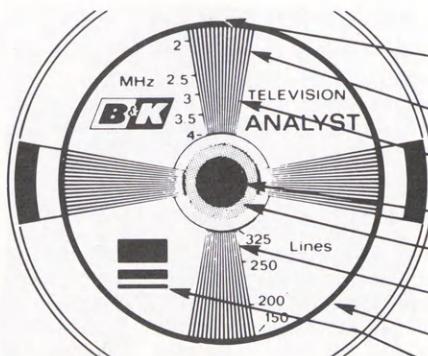
(B) COLOR BAR—Crystal-controlled keyed rainbow color display and scanner signal for checking color sync, hue range and color alignment. Also demonstrates correct color values to customers. Burst and color signal are also provided and are front-panel adjustable.

(C) WHITE DOT SLIDE—Used to check static convergence.

TV ANALYST SLIDES

Model ASM-110 Slide Set: Replacement set of four slides of flying spot scanner patterns for Model 1077B (normally furnished with Analyst).

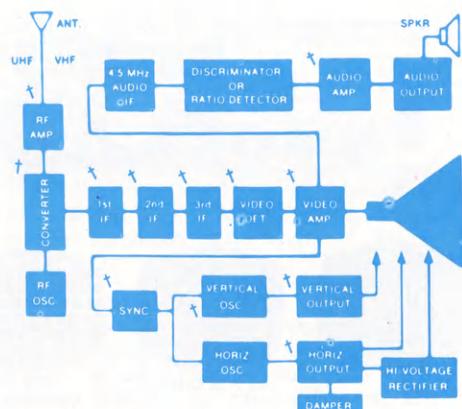
How the 1077B's Signal Substitution Cuts Servicing Time in Half



This Standard Test Pattern or other signal of your choice can be injected at all the stages shown in the block diagram on the right.

The 1077B pinpoints these typical problems instantly:

- To set proper picture size, set top and bottom of circle to top and bottom edges of receiver screen.
- Frequency response (bandwidth) in MHz is shown at point where lines of wedge merge.
- Ringing and overshoot are indicated by white trailing edges.
- Adjust center of pattern to physical center of receiver screen.
- Graduated gray scale at center shows video system capability.
- Resolution is shown in number of lines at point where lines of wedge merge.
- Adjust receiver for perfect circle to set linearity, height and width.
- Low frequency phase shift causes a black trailing smear.



The 1077B injects the proper substitute signal at all these points.

THE 1077B GENERATES ALL THESE SIGNALS:

(All VHF, UHF, & IF signals operate with or without modulated sound channel, and with or without keyed color bar pattern which can be used simultaneously with any video signal desired.)

All signals normally transmitted by a TV station and generated within a TV receiver for point-by-point signal substitution techniques.

VHF signals on 8 channels

UHF signals on channels 14 to 83

- IF signals of 20 to 48MHz
- Positive or negative composite video
- Keyed color bar pattern which modulates RF output
- Color rainbow for injection into color IF amplifiers and demodulators
- 4.5MHz frequency modulated by a 1kHz audio tone
- 1kHz audio tone
- Composite positive or negative sync pulses with adjustable amplitude to test sync, CRT, blanking and keyed AGC

- Vertical grid drive
- Vertical plate drive
- Vertical solid state sweep drive
- Vertical yoke test signal
- Horizontal plate drive
- Horizontal grid drive
- Horizontal solid state sweep drive
- High-level keying pulse for keyed circuits, AGC, burst amplifiers and blanking
- Broadcast type test pattern
- Dot/bar/crosshatch patterns for color convergence adjustments

SPECIFICATIONS

Outputs:

Note: RF and IF signals, 75 Ω output

IF: 20-48MHz, 0-70,000μV minimum.

VHF: Channels 2 to 6, 0-12,000μV minimum; Channels 7 to 13, 0-6000μV minimum.

UHF: Channels 14 to 83, 0-100μV minimum.

Video: Composite signal, 0-2.5V peak-to-peak minimum at 1000 ohms, positive or negative polarity.

Sync: 0-50V peak-to-peak, continuously variable, positive or negative polarity. Output impedance, 10K ohms at 50V, 1K ohms at 10V.

4.5MHz: Frequency modulated by 1kHz tone.

1kHz: 1V peak-to-peak minimum at 300 ohms.

Color: 3.563795MHz, crystal-controlled; 0.5-5V peak-to-peak; 100 ohms at minimum, 1000 ohms at maximum volts.

Vertical Grid Drive: 60Hz; 0-150V peak-to-peak.

Horizontal Grid Drive: 15,750Hz, crystal-controlled, ±0.5%; 150V peak-to-peak minimum.

AGC Keying Pulse: 15,750 Hz; 400V p-p high-Z.

Horizontal Plate Drive: Sufficient to drive all vacuum tube circuit flyback transformers.

Horizontal Solid-State Sweep Drive: Variable, 0-11V peak-to-peak.

Vertical Plate Drive: Sufficient to drive all vacuum tube circuit vertical transformers.

Vertical Solid-State Sweep Drive: Variable, 0-17V peak-to-peak.

General:

Power Requirements: 105-125VAC, 60Hz, 100W. Three-wire line cord.

Size (HWD): 24 x 45 x 30cm (9.6 x 18 x 12").

Weight: 11.9kg. (26.5 lbs.).

Complete with test pattern slides, all leads and 111-page instruction manual.

High-Voltage Direct-Reading 40kVDC Probe

MODEL

HV-44



The HV-44 high-voltage probe meter offers extreme reliability and user safety. Voltage measurements up to 40,000 volts are performed accurately and quickly. The HV-44 is factory calibrated at 25kV and should never need recalibration. Accuracy at 25kV is ±2% and ±3% at full scale. The core magnet type meter is unaffected by common outside magnet fields and is highly shock resistant. The probe body is molded of high-impact ABS plastic for maximum insulation and lightest weight. The HV-44 will hold up under the most active field service conditions, preventing down time and possible

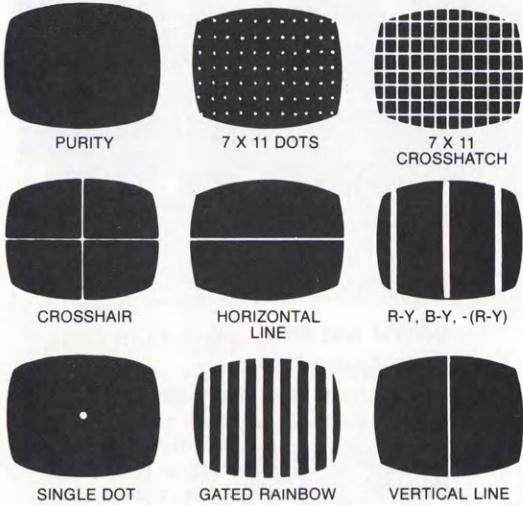
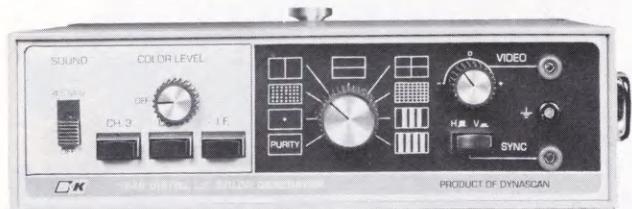
lost business. Supplied with two interchangeable tips: one conventional round needle type and one specially designed flat spring type, for easy access to CRT anode.



MODEL LC-32 CARRYING CASE

Use this optional vinyl case to carry your AV-2B, PR-28, HV-40 or HV-44 safely to any job.

Digital IC Color Generator/Analyst



MODEL 1248

- Nine patterns
- RF, IF, video, sync and sound outputs
- Stable crystal-controlled RF and IF outputs
- The closest thing to a portable Analyst

PURITY—Provides sync and ultra-clean reference black level for clear raster. **SINGLE DOT**—Simplifies static convergence by automatically pinpointing screen center. **7 x 11 DOTS**—Checks convergence over whole screen. **SINGLE VERTICAL LINE**—For top and bottom dynamic convergence. **SINGLE HORIZONTAL LINE**—For left and right dynamic convergence. **CROSSHAIR**—Checks deflection centering and aids in "roughing in" static convergence. **7 x 11 CROSSHATCH**—For dynamic convergence, linearity, size and overscan adjustments. **R-Y, B-Y, -(R-Y)**—Expedites color alignment procedures. **GATED RAINBOW**—To test and align color circuits.

SPECIFICATIONS

LINE WIDTH—Horizontal: One horizontal scan line. **Vertical:** Preset to $.25\mu\text{SEC}$, internally adjustable from $.1$ to $.8\mu\text{SEC}$.

CHROMA—Offset subcarrier system using a frequency of 3.579545MHz minus one horizontal line ($15,734\text{Hz}$), or $3.563811\text{MHz} \pm .001\%$. Color bars are produced by gating with 189kHz . Color subcarrier level is adjustable from 0 to 150% with a front-panel control.

SIGNAL SYNTHESIS—A progressive scan system using digital binary logic derives all sync and video information.

SYNC PULSES—Horizontal: Period, $63.55\mu\text{SEC}$ ($15,734\text{Hz}$); width, $5.08\mu\text{SEC}$. **Vertical:** Period, $16.65\mu\text{SEC}$ (60.05Hz); width, $190\mu\text{SEC}$. **Output:** $+5\text{V}$ peak horizontal or vertical, switch selectable and independent of video output level control.

BLANKING PULSES—Horizontal: Front porch, $1.27\mu\text{SEC}$; rear porch, $3.81\mu\text{SEC}$; total, $11.43\mu\text{SEC}$. **Vertical:** Front porch, $224\mu\text{SEC}$; rear porch, $983\mu\text{SEC}$; total, $1.39\mu\text{SEC}$.

OUTPUT CARRIERS—Frequencies: Channel 3, channel 4, 45.75MHz IF (all crystal-controlled) and $4.5\text{MHz} \pm 0.2\%$ unmodulated audio, all switch selectable. **Level**— $10,000\mu\text{V}$ minimum into a 300Ω load.

APPLICATIONS

Locate dead IF stages...Check operation of mixer, RF and local oscillators...Check stages sequentially...Locate color shifts and internal ghosts from RF, mixer, IF or video stages. Plus all standard color generator uses.

FEATURES

Switchable horizontal and vertical sync output...Sync level independent of video level control...LSI MOS chip generates all patterns and logic functions...Crystal controlled RF and IF outputs...Switchable 4.5MHz sound carrier...Lightweight.

It's just not practical to haul bench instruments with you on service calls. But there are many service questions a typical bar/dot generator can't help you answer. So we've built some of the essential functions of our famous 1077B Analyst into this deluxe digital IC Color Generator/Analyst to help speed in-home diagnosis. As a generator, it's rock-steady, thanks to crystal-controlled picture carrier oscillators. All sync and video information is derived from digital logic countdown chains for maximum stability.

VIDEO OUTPUT— 0 to $\pm 1.5\text{V}$ p-p, into 75Ω . Amplitude and polarity continuously variable with front-panel control.

MECHANICAL—Operating Temperature Range: -25°C to $+75^\circ\text{C}$ (-10°F to 165°F).

POWER REQUIREMENTS: $105-130\text{VAC}$, 60 Hz .

SIZE (HWD): $5.7 \times 17.8 \times 28.8\text{cm}$ ($2.25 \times 7 \times 9.38''$).

WEIGHT: 1.81 kg (4 lb.)

CSA approved version available. With cable storage space, carrying case, detailed instruction manual.

MODEL 1230

- Four broadcast-stable patterns in the palm of your hand—crosshatch, 7x11 dot, gated rainbow; purity.
- Digital logic IC's for compact reliability



This fine quality easy-to-use portable generator is designed for quick reliable convergence of color TV sets in the field. It's small enough to hold in the palm of the hand (just $1.73''$ high, $5''$ wide and $7.75''$ deep) and easily fit in your tube caddy.

All signals (video, sync, blanking, and color) are derived from and synchronized with a crystal-controlled master oscillator, assuring stable jitter-free patterns. This unique feature allows you to expand and examine the quality of the color subcarrier on an oscilloscope. Pattern stability is also assured by the progressive scan system, which presents the same signal on each field. Accuracy and dependability are further assured by the use of reliable digital integrated circuits in all counting functions.

SPECIFICATIONS

LINE WIDTH

Horizontal: One horizontal line. **Vertical:** Pre-set to $.25\mu\text{SEC}$, internally adjustable from $.1$ to $.8\mu\text{SEC}$ for dot and vertical line width.

CHROMA

Offset Subcarrier System: Uses frequency of 3.579545MHz — 1 horizontal line ($15,734\text{Hz}$) or 3.563811MHz , $\pm .001\%$. Ten bars are produced by gating with a 188.8kHz square wave. **Subcarrier Level:** Adjustable from 0 to 200% with front panel color level control.

RF OUTPUT

Channels: Factory tuned to Channel 3 ($61.25\text{MHz} \pm .5\%$); user adjustable to channel 4 or 5. **Level:** $10,000\mu\text{V}$ minimum into a 300-ohm load.

SIGNAL SYNTHESIS

Progressive Scan System: Uses digital logic ele-

ments to derive all sync, video and chroma information. Entire countdown chain is synchronized to the $4.751748\text{MHz} \pm .001\%$ master oscillator.

SYNC PULSES AND BLANKING PULSES

Horizontal Period: $63.55\mu\text{SEC}$ ($15,734\text{Hz}$). **Horizontal Width:** $5.05\mu\text{SEC}$. **Vertical Period:** $16.71\mu\text{SEC}$ (59.82Hz). **Vertical Width:** $254.2\mu\text{SEC}$.

Horizontal: Front porch, $1.89\mu\text{SEC}$; rear porch, $5.68\mu\text{SEC}$; total $12.62\mu\text{SEC}$. **Vertical:** Front porch, $254.2\mu\text{SEC}$; rear porch, $953.2\mu\text{SEC}$; total, $1461\mu\text{SEC}$.

MECHANICAL

Power Requirements: $105-130\text{VAC}$, 60 Hz . CSA approved version available.

Operating Temperature Range: $0-70^\circ\text{C}$ with no performance degradation.

Size (HWD): $4.3 \times 12 \times 19\text{cm}$ ($1.73 \times 5 \times 7.75''$).

Weight: 907g . (2 lbs.).

100% Dynamic Gm Tube Tester



High-Voltage and Gas Regulators: The 747B is the only tube tester that has an effective dynamic test for voltage regulators.

Shorts and Leakage Test: Leakage paths up to 1 megohm will light the SHORTS lamps and the meter detects leakage current as low as 0.5 microamp.

NEW TUBE INFORMATION SERVICE

Published every four months; available on yearly subscription or single issue basis. For Models 606, 607, 666, 667, 707, 747, 747B, 465, 466, 467, 470. Specify Model.

MODEL

667



SPECIFICATIONS

Type of Tests: Cathode Emission, Shorts, Grid Emission and Gas

Test Capabilities and Method:

- Tests all commonly encountered tubes plus many special and industrial types.
- Multiple filament voltages, loads and lockouts provided.
- F.E.T. solid state DC amplifier drives precision meter.

MODEL

747B

SOLID-STATE DYNA-JET

- Tests all tubes with true dynamic mutual conductance test
- Front Panel overload reset eliminates need for fuse replacement—indicates overload, saves time

Grid Emission Test: Single pushbutton check for gas, grid emission and grid-to-cathode leakage.

Life Test: A single switch reduces operating voltages 10%.

Patented Automatic Line Voltage Compensation: A B&K-Precision exclusive, this insures consistently reliable and repeatable test results.

Tube Chart: Over 2,500 listings indexed with all setup instruction for each tube type.

The 747B has a rugged, lightweight molded case. **Power Required:** 105-125 VAC, 60 Hz. CSA approved. **Size (HWD):**

13 x 50 x 30cm (5.3 x 20.5 x 11.5"). **Weight:** 5.8kg (13 lbs.).

Jet-Check Section: Almost all TV and radio tubes can be checked very quickly for dynamic mutual conductance in this section. Only two settings are required—HEATER and SENSITIVITY. One pushbutton gives a direct reading of the tube's mutual conductance in terms of BAD—?—GOOD.

Programmed Section: New and less popular types are tested in this section for dynamic mutual conductance. A program switch for each tube pin sets up the test circuit eliminating obsolescence, because any new tube types can be tested here with the data provided as the tubes are introduced.

Tube Tester Adapters

Model TC-62B: Novar adapter; for Models 600, 606, 607, 666, 667. **Model TC-70:** Adapter for high-voltage rectifier tubes; for Models 600, 625, 606, 607, 666, 667. **Model TC-75:** Adapter for 6BK4; for Models 600, 625, 606, 666, 700, 707. **Model TC-80:** Magnoval adapter; for Models 600, 625, 700, 707.

High Speed Tube Tester

SOLID-STATE DYNA-JET

- Detect all shorts in any tube with no false readings
- Tubes accurately tested under simulated loads
- Maximum of 4 settings required
- Exclusive grid leakage and gas tests
- Superior plate/load voltage capability
- Tests cathode emission
- Obsolescence proof
- Attractive attache-style case.

TESTS

All the newest tube types—plus Nuvistors, Novars, Magnovals, 10-pin tubes and 12-

pin Compactrons, imported high-fidelity tubes and many types of industrial and special applications tubes. Tube information update service available, making the 667 virtually obsolescence proof. All tests are fast without complex setup procedures.

Here's the only tube tester in its price class that gives you positive SHORTS indication in any tube tested. How often have you been frustrated because the chart says "Short Normal" or "Disregard Shorts"—because there was no way to open up the pin connections? The Model 667 Dyna-Jet has 10 lockout pushbuttons that can open any and all multiple-connected pins in any tube under test.

The QUALITY test requires just 3 or 4 settings. Shape-coded symbols match control to chart to speed tests and eliminate errors. Cathode emission is checked the accurate way—under simulated load conditions. High-sensitivity grid emission, leakage and gas tests.

Short Sensitivity: 1 Megohm. **Short Indicator:** Neon Bulb. **Grid Leakage Sensitivity:** 100 Megohms. **Grid Leakage Indicator:** High input impedance F.E.T. amplifier drives meter.

Special Features:

- Multiple lockout pushbuttons permit rapidly opening any desired combination of tube pin connections.
- Reset button clears all lockouts simultaneously.

Case: Portable attache-type constructed of black, weatherproof, durable molded plastic. **Size:** 34 x 25 x 13 cm (10 x 13 x 5 1/8") thick, including cover. **Weight:** 2.7 kg. (6 lbs.).

Input Power: 117 VAC, 60 Hz continuous duty. 50 Hz intermittent duty. CSA approved.

CRT Restorer/Analyzers ... fast, safe, profitable!

MODEL 467



Picture Tube Guarantee

YOU CAN GUARANTEE RESTORATION

B&K-PRECISION has found that more than 95% of CRT's function as well as new tubes after restoration. That's why we think you can profitably guarantee each restoration for up to two years with 100% of the restoration fee creditable toward a new CRT during that period.

MODEL 470



SEE PAGE 45 FOR COMPLETE LIST OF
OPTIONAL ADAPTERS.

- Exclusive multiplex technique tests all three guns of color CRT simultaneously under actual operating conditions
- Uses the most powerful restoration method known with minimal danger to CRT—guarantee results with confidence!
- All CRT's checked identically—including all "inline" and "one-gun" types
- The fastest way to test and restore any CRT
- EXCLUSIVE! Tests focus electrodes lead continuity
- Obsolescence proof: perpetual set-up chart updates and new adapter development

The 467 is ideal for the active service shop, where time is most valuable. You'll test and restore CRT's faster than you ever thought

SPECIFICATIONS

Tests Performed: emission, leakage, tracking (color tubes), life, focus continuity. **Restoring Functions:** shorts removal, gun cleaning and balancing, cathode rejuvenation. **Meters:** (Three 2½" D'Arsonval movement). **Indications:** Emission (0-2mA), Restoring current (0-2 scale), heater voltage (0-15), G1 bias (30-100V), line voltage (100-130V), leakage (neon indicator). **Accessories:**

- Same powerful restoration method as 467!
- Measures true dynamic beam current like 467.
- All CRT's checked identically.
- Removes shorts and leakage.
- Obsolescence proof: perpetual set-up chart updates and new adapter development.

The B&K-PRECISION Model 470 is a value leader in its class. The same powerful restoration method employed in the 467 is featured on the 470, providing results you can guarantee.

A single large meter with multicolor scales is featured for accurate display of tube condition to the customer.

The 470 is designed to be a profitable investment—even for part-time technicians. Time tested, easy to understand test procedures allow you to make testing and restoration a fast job. You'll also be able to save more picture tubes, because the 470 removes shorts and leakage.

SPECIFICATIONS

Tests Performed: emission, leakage, tracking (color tubes), life. **Restoring Functions:** shorts removal, gun cleaning and balancing cathode rejuvenation. **Meters:** (one 4½" D'Arsonval movement). **Indications:** Emission (0-2mA), Restoring current (0-2 scale), heater voltage (0-15), G1 bias (30-100V), leakage. **Accessories:** **Adapters included:** CR1—90° in-line RCA; 110° color; CR-2—70° color; CR-3—90° RCA button-base—large Trinitron; CR-4—90° GE in-line button-base and special 90° button adapter; CR-5—Small Trinitron; CR-6—110° B/W RCA button-base. **Case:** one-piece, high-impact polyethylene, with internal cord and adapter storage. **Power Requirements:** 117 VAC, 60 Hz, 40 watts. CSA approved version available. **Size:** 34 x 25 x 14 cm (13½ x 10 x 5¾"). **Weight:** 4.5 kg (10 lbs.).

possible, with fewer callbacks. In an active shop the 467 will rapidly pay for itself in time saved and customer satisfaction.

The 467 is unique—for several reasons. First, B&K-PRECISION's exclusive patented TriDynamic™ test method lets you see the performance of each gun on its own meter—simultaneously! Second, the 467 measures only beam current that actually passes through the G1 aperture to the screen.

The 467 uses unique computer-derived digital circuitry to bring picture tube rejuvenation and analysis into the modern age. All three guns of a color picture tube are tested in sequence 20 times per second. Because all three guns of a color picture tube are tested simultaneously, leakage between the elements of different guns is pinpointed immediately. Cathode-to-cathode leakage, once virtually impossible to diagnose, is displayed as positively as common G1-to-cathode and cathode-to-heater leakage.

Adapters included: CR-1—90° in-line RCA; 110° color; CR-2—70° color; CR-3—90° RCA button-base—large Trinitron; CR-4—90° GE in-line button-base and special 90° button adapter; CR-5—Small Trinitron; CR-6—110° B/W RCA button-base. **Case:** one-piece, high-impact polyethylene, with internal cord and adapter storage. **Power Requirements:** 117 VAC, 60 Hz, 40 watts. CSA approved version available. **Size:** 34 x 25 x 14 cm (13½ x 10 x 5¾"). **Weight:** 4.5 kg (10 lbs.).

467/470 FEATURES POSITIVE GOOD-BAD TESTS

Unlike other testers and restorers, the 467 and 470 give you definite "yes or no" answers to tube condition. Your customer will also get an extra measure of confidence because he can clearly see the condition of his picture tube displayed on the easy-to-read meter.

AUTOMATIC RESTORATION TIMING

The cathode of the individual tube governs restoration duration, so you can't possibly make a costly timing error that will cause cathode stripping. Heater voltage is supplied to the cathode. A larger cathode automatically allows more current to flow longer than a smaller cathode.

CRT INFORMATION SERVICE

Covers all B&K-Precision testers—specify model number. Each new chart complete in itself; lists common CRT's plus new types as data becomes available. Issued twice a year. Information on this service is available with the 467 and 470.

2—70° color; CR-3—90° RCA button-base—large Trinitron; CR-4—90° GE in-line button-base and special 90° button adapter; CR-5—Small Trinitron; CR-6—110° B/W RCA button-base. **Case:** one-piece, high-impact polyethylene, with internal cord and adapter storage. **Power Requirements:** 117 VAC, 60 Hz, 40 watts. CSA approved version available. **Size:** 34 x 25 x 14.4 cm (13½ x 10 x 5¾"). **Weight:** 3.5 kg (7 lbs.).

Instrument Carrying Cases



LC-74 Protective Cover



LC-132 Case



LC-14 Case



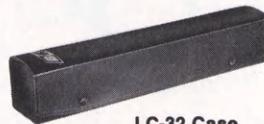
LC-18 Case



LC-83 Case



LC-28 Case



LC-32 Case

Extra convenience, protection, and attractive appearance for your B&K-PRECISION test instruments. Handsome grained leatherette, with rugged snaps and fasteners.

Model LC-18 Case. For Model 1827 Frequency Counter; replacement for Model 510 Transistor Tester.

Model LC-27 Case. For Model 277 FET Meter.

Model LC-28 Case. Deluxe carrying case for Models 280, 2800, 2810 and 820. Has convenient handle and compartment for test probes.

Model LC-32 Case. For Model AV-2B, PR-28, HV-40 and HV-44 high-voltage probes.

Model LC-83 Case. Deluxe carrying case for Model 283 DMM.

Model LC-14 Case. For Models 1403 and 1403A Oscilloscopes.

Model LC-31 Protective Cover. For Model 1431 Oscilloscope. (not shown)

Model LC-50 Case. Deluxe carrying case for Models 1820, 1850, 2830, 3010 and 3020.

Model LC-70B Protective Cover. For Model 1460, 1465, 1470, 1471 and 1472 Oscilloscopes. (not shown)

Model LC-74 Protective Cover. For Model 1461, 1471B, 1472C, 1474 Oscilloscopes.

Model LC-132 Case. Deluxe carrying case for Model 1432. Includes storage pocket for probes, manual, etc.

CRT Restorer/Analyzer Adapters

Model CR-1 thru CR-6 adapters are included with Models 467 and 470 CRT Restorer/Analyzer. Model CR-7 thru CR-18 Adapters are optional. All may be used with Model 465 Restorer with a Model SP-65 adapter converter, or with Model 466 Restorer with a Model SP-66 adapter converter. Refer to the latest setup chart for your restorer to find the proper adapter to use for any CRT you wish to test.

Model CR-1 Adapter. Use to test RCA standard 110° color types 18VANP22, 19JXP22, 19VBLP22, 19VCWP22, others. Also RCA 90° color types 15VADP22, 17VANP22, 19VDP22, 19VEQP22, others.

Model CR-2 Adapter. Tests 70° color types 14BCP22, 17EJP22, others.

Model CR-3 Adapter. Tests RCA button base 90° color, type 470BEB22 types 17EZP22, 19GXP22, 23VBSP22, others, and large Trinitron.

Model CR-4 Adapter. Tests special 90° and GE standard inline types 15YP22, 16VBSP22, 16VEMP23, others.

Model CR-5 Adapter. Tests small color Trinitron types 250NB22, 330AB22, 400DNB22, others.

Model CR-6 Adapter. Tests RCA button base 90°, std. B&W 11JP4, 16XP4, 19GEP4, 470ARB4, others.

Model CR-7 Adapter. Tests 7-in miniature standard B&W types 9AEP4, 12CWP4, 230AB4, others.

Model CR-8 Adapter. Tests 7-pin miniature special B&W types 9XP4, 110CB4, 140AKB4, others.

Model CR-9 Adapter. Tests RCA button base special B&W 17DEP4, 19ABP4, 21EAP4, others.

Model CR-10 Adapter. Tests Duo-Decal 70° B&W types 8HP4, 14BAP4, 16RP4, others.

Model CR-11 Adapter. Tests Sylvania shell 70° B&W 12BEP4, 16BCP4, 17BYP4, 23JP4, others.

Model CR-12 Adapter. Tests GE Inline special color types 11SP22, 11WP22, others.

Model CR-13 Adapter. Tests Quintrex Color types 510FLB22, 370BRB22, 420AMB22, others.

Model CR-14 Adapter. Tests Japanese miniature base color types 250XB22, 420UB22, others.

Model CR-15 Adapter. Tests Japanese inline color CRT types 9VACP22, 370AUB22, 270BV22, others.

Model CR-16 Adapter. Tests Sylvania and GE 90° inline 13VAHP22, 17VAQP22, 19VEBP22, others.

Model CR-17 Adapter. Test new Sony Trinitron types 520HB22, 570AB22, others.

Model CR-18 Adapter. Test Zenith special inline types 13VAMP22, 17VBDP22.

Model CR-19 Adapter. Tests 470ADB22, 510EUB22, 560HB22, 670CB22 and similar types.

Model CR-20 Adapter. Tests 19VGZP22, 19VHSP22, 25VETP22, 25VEUP22, 25VEWP22.

Model CR-21 Adapter. Test European 110° in-line CRTs. A56-500X, A66-500Y.

Model CR-22 Adapter. Test GTE Sylvania 100° color tri-potential. 19VHTP22, 25VEMP22.

REPLACEMENT CRT TESTER ADAPTERS FOR MODEL 465 and 466
(Included with Models 466 and 465.)

Model CR-60. Black-and-white CRT adapter; replaces adapter furnished with the Model 465.

Model CR-61. Color CRT adapter; replaces adapter furnished with the Model 465.

Model CR-62. A, B, and C black-and-white CRT adapter; replaces unit furnished with Model 466.

Model CR-63. H, J, color CRT adapter; replaces adapter furnished with the Model 466.

Model CR-64. K, L, color CRT adapter; replaces unit furnished with the Model 466.

(Special optional CRT adapters for use with Models 465 and 466. These adapters are not furnished with the instruments.)

Model ASM-58B. Replaces "D" adapter furnished

with testers; adapts to Type 23EP4 CRT. For use with all models, except the 466, 467, 470.

Model CR-54. 90° color adapter for Model 465. Adapts G.E. CRT's 15MP22, 15YP22, 17EXP22 and 17FJP22.

Model CR-55. Adapts to Type 12BRP4 transistorized CRT. For use with Models 445 and 465.

Model CR-56. 110° color CRT adapter for Model 465. For CRT types 18VANP22, 19VBLP22, 19VCWP22.

Model CR-57. Adapts to 20 mm-neck CRT's. For Models 445, 465.

Model CR-58. Adapts to G.E. Type 11SP22 and 11WP22 color CRT's. For use with Model 465.

Model CR-59. Adapts Model 465 to RCA In-Line picture tube.

Model CR-65. Black-and-white CRT adapter for Model 466. Adapts CRT types 23EP4, 23Q4, and a number of imported CRT's.

Model CR-66. 90° color CRT adapter for Model 466. Adapts G.E. CRT's 15MP-22, 15YP22, 17EXP22 and 17FJP22.

Model CR-67. 110° color CRT adapter for Model 466. Checks: 18VANP22, 19VBLP22, 19VCWP22.

Model CR-69. For use when testing RCA in-line CRT's on Model 466.

CONVERTERS FOR MODELS 465 and 466

Model SP-65 Adapter Converter. Converts cable termination on B&K-PRECISION Model 465 Restorer/Analyzer to termination on new adapter Models CR-1 thru CR-22. Updates older model restorer to test new CRT types.

Model SP-66 Adapter Converter. Converts cable termination on B&K-PRECISION Model 466 Restorer/Analyzer to termination on new adapter Models CR-1 thru CR-22.

Instrument Probes and Cables

10:1/Direct Probes For Oscilloscopes, DMM's, Frequency Counters and Multimeters



PR-30, PR-34

PR-31

PR-35, PR-36

PR-21

PR-25

The B&K-PRECISION PR-30 through 36 series of probes is designed to be compatible with most scopes available, up to 50MHz. All probes feature both 10:1 and direct functions, with a unique pull-apart switch design. A window always clearly indicates the position in use. Other features include slim body design, adjustable compensation capacitor, replaceable ground lead and a spring loaded retractable tip cover. The entire probe body is molded of rugged plastic with a steel inner structure. An integral cable strain relief further adds to reliability. Cable length: 36".

The B&K-PRECISION Model PR-21 is

a low-cost isolation direct probe designed for use with digital or analog electronic multimeters or oscilloscopes to 10MHz (direct only). The PR-21 prevents capacitive loading and RF interference when measuring DC in RF circuits. Provides 100K isolation in isolation position. Case is fully shielded. Cable length: 36".

The PR-25 is a 10:1/direct probe specifically designed for use with frequency counters up to 60MHz. Shielded compensation circuit reduces the possibility of double counts when measuring square waves. Ten-megohm position minimizes loading effects on high-impedance circuits. Cable length: 36".

MODEL	FREQUENCY RESPONSE	MAX. V.	DIRECT IMPEDANCE	SCOPE INPUT CAPACITANCE	APPLICATION	CONNECTOR
PR-21	10 MHz ¹	500	1 meg/100pF	15-120pF	A, B	Dual Banana
PR-25	60 MHz	200	1 meg/110pF	*	C	BNC
PR-30	10 MHz	500	1 meg/120pF	15-120pF	B, C	UHF
PR-31	10 MHz	500	1 meg/120pF	15-120pF	B, C	BNC
PR-34	15 MHz	500	1 meg/120pF	10-35pF	B, C	UHF
PR-35	15 MHz	500	1 meg/120pF	10-35pF	B, C	BNC
PR-36	50 MHz	500	1 meg/120pF	10-35pF	B, C	BNC
PR-37	100MHz ²	600	1 meg/40pF	10-60pF	B, C	BNC

¹Compensation capacitor fixed at 10pF ¹Response for direct position

²Response for x10 position A=DMM and Multimeter B=Scope

C=Frequency Counter

Demodulator Probes For Oscilloscopes, DMM's and Multimeters



PR-151
AV-1A

PR-32

PR-23

All purpose demodulator/detector probes, usable with most any oscilloscope, DMM or analog electronic voltmeter. Features include lightweight design and 36" coaxial cable. Probe bodies are constructed of rugged plastic and internally shielded against stray R-F pickup.

Model	Freq. Response	Input Impedance	Connector
PR-23	-6db @ 250MHz	>30K shunted <45pF	Dual Banana
PR-32	-6db @ 250MHz	>30K shunted <45pF	BNC
PR-151*	-6db @ 250MHz	>30K shunted <45pF	Mic
AV-1A	-6db @ 250MHz	>30K shunted <45pF	Mic

*Negative output polarity

High-Voltage Multiplier Probes



MODELS

PR-28
AV-2B

LETS YOU MAKE SAFE HIGH-VOLTAGE MEASUREMENTS

The PR-28 lets you read voltages beyond the range of your present voltmeter. In the safest one-hand-in-the-pocket manner, the shape of the handle and the long probe tip allow you to keep a safe distance from voltages to 40kVDC.

The PR-28 can be used with B&K-PRECISION Models 277, 280, 281, 282, 283, 290, 2800, 2810 and 2830 or with any other constant-impedance voltmeter. Has banana plugs.

The AV-2B is similar to the PR-28 but is designed for use with the B&K-PRECISION Model 177 and similar VTVM's. Extends range to 50,000 VDC. Has MIC type connector.

SPECIFICATIONS

PR-28—**Voltage Range:** Usable to 40kVDC and 20kVAC (60Hz); multiplies instrument range by 1000 (e.g., 40V becomes 40,000V); for any instrument having a constant impedance of 10 megohms or greater. **Impedance:** 600 ohms nominal. **Accuracy:** $\pm 2\%$, plus instrument accuracy. **Calibration:** Internal; factory calibrated at 25kV. **Frequency Range:** DC-80Hz; 20kVAC max. at 60Hz. **Size:** 35.56cm (14") long x 5.72 cm (2.25") max. diameter; 76.2cm (30") cord. **Weight:** 199g. (7 oz.).

AV-2B—**Voltage Range:** Usable to 50 KVDC. Multiplies instrument range by 100 (400V becomes 40,000V); for any VTVM designed for a one-megohm probe; having a constant impedance of 10 megohms or greater. **Accuracy:** $\pm 3\%$ plus instrument accuracy. Other specifications are same as PR-28.

Deluxe 10:1/Direct Probes



The B&K-PRECISION Model PR-37 deluxe probe is designed for use with wideband oscilloscopes to 100 MHz. The PR-37 is a slim-body probe of precision lightweight construction. A three-position switch selects 10:1 or direct modes, or a reference position that grounds the tip through a 9M resistor. The 52" coaxial cable is extremely flexible. Accessories included with the PR-37 are a spring-loaded retractable tip cover, insulating tip, BNC tip adapter, IC tip and an insulated compensation capacitor adjustment tool. The insulating tip is designed for probing dense solid-state circuitry with no danger of shorting nearby components.

The BNC adapter tip converts the probe tip into a push-on BNC fitting, ideal for interface with test points or output jacks. The IC tip guides the probe contact onto any pin of a standard DIP, making it almost impossible to short two pins of an IC. The PR-37 is available in both grey and red colors. Probes of different colors are particularly useful with a dual-trace scope for instant identification of which channel a probe is connected. The PR-37 and accessories come in convenient zippered vinyl case. Order model PR-37G (grey) or PR-37R (red).

“Dyna-Flex” Probe

Model FP-5 “DynaFlex”
Probe. Positive contact is assured by spring-loaded needle-sharp tips. Spacing of 3 tips, adjustable with one hand from 1/32" to 5/8" for rapid, easy access when testing densely packed miniaturized arrays. Eliminates costly, time-consuming unsoldering operations. Each tip is colorcoded for fast, easy identification. Ideal for use with semiconductor tester models 510, 520 or 530. 24" cable.

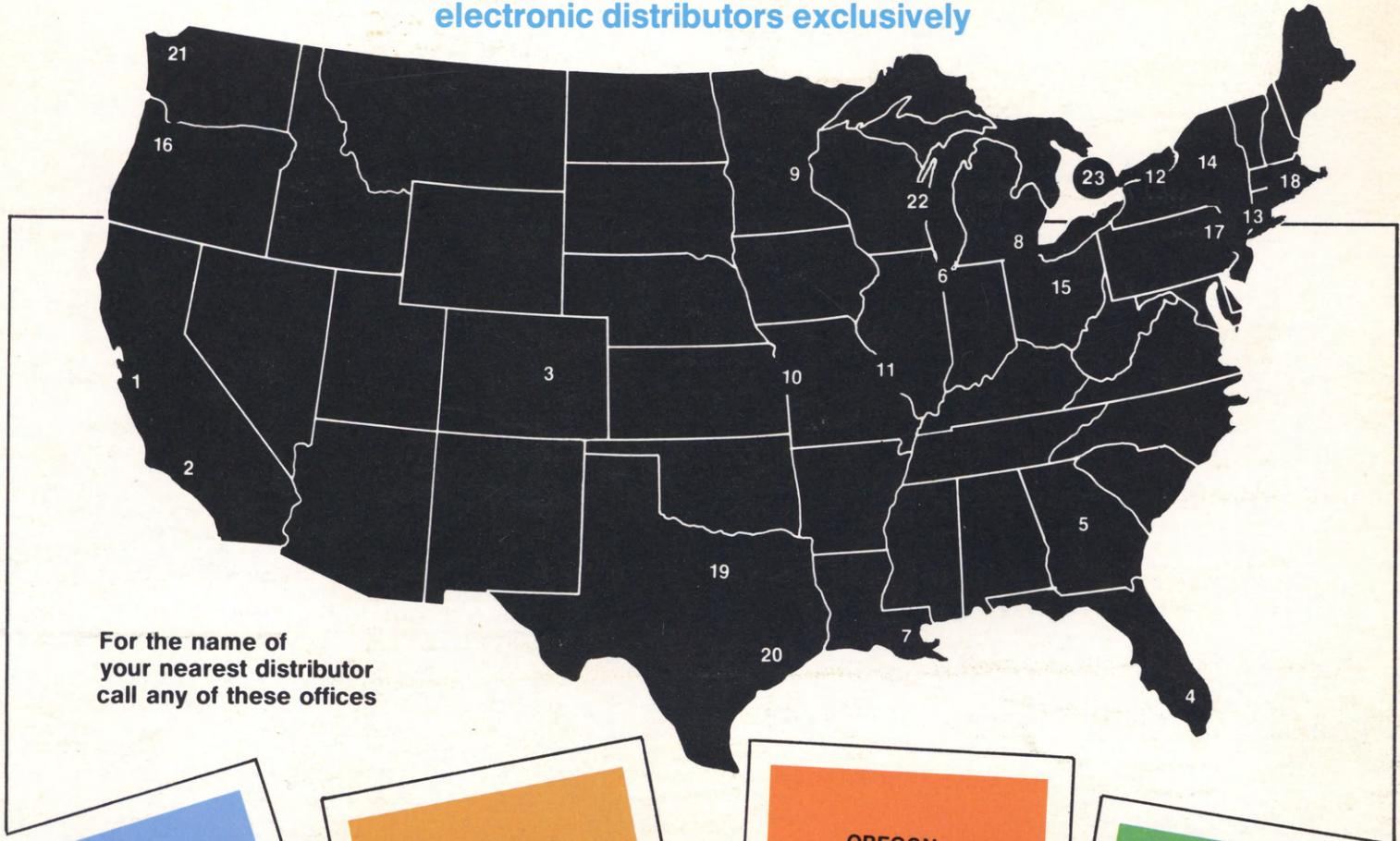
INSTRUMENT CONNECTING CABLES

- Model CC-41. 36" RG/58U with a BNC connector on each end.
- Model CC-42. 36" RG/58U with BNC connector and UHF connector (PL-259).
- Model CC-43. 36" RG/58U with BNC connector and banana plugs.
- Model CC-44. 36" RG/58U with BNC connector and coaxial microphone connector.
- Model CC-45. 36" RG/58U with BNC connector and type N connector.
- Model CC-46. 36" RG/58U with UHF connector (PL-259) on each end.
- Model CC-47. 36" zip cord with spade lugs and cigarette lighter plug.
- Model CC-48. 36" audio coax with 1/4" phone plug and dual banana plug.
- Model CC-49. 36" audio coax with phono plug to dual banana plugs.
- Model CC-50. 36" audio coax with 3.5 mm mini-phone plug to dual banana plug.
- Model CC-51. 20" audio coax with phono plug to alligator clip leads.
- Model CC-52. 72" DC power cord for Model 1827 frequency counter.
- Model FP-6. Color-coded mini-lock clip leads with banana plugs for semiconductor testers. 24" leads.

B&K-PRECISION PROBE/INSTRUMENT QUICK-REFERENCE

MODEL NO.	DESCRIPTION	CONN. TYPE	PRODUCT USAGE
AV1A	250MHz RF Probe	Mic	Meters: 175, 177, 375
AV2B	50KVDC High-Voltage Probe	Mic	Meters: 175, 177, 375
FP5	Dynaflex-Probe	Banana	Semiconductor Testers: 501A, 510, 520, 530 Meters: 280, 281, 282, 283, 290, 2800, 2810, 2830
PR21	Isolation/Direct Probe	Dual Banana	Scopes: 1403, 1403A Meters: 277, 280, 281, 282, 283, 290, 2800, 2810, 2830
PR23	RF Detector/Demodulator Probe	Dual Banana	Scopes: 1431, 1440, 1460, 1465, 1470 Meters: 280, 281, 282, 283, 290, 2800, 2810, 2830
PR25	10:1/1:1 Compensated Counter Probe	BNC	Frequency Counters: 1801, 1827 (with BNC to phono adapter, not provided)
PR28	40KVDC High-Voltage Multimeter Probe	Dual Banana	Meters: 277, 280, 281, 282, 283, 290, 2800, 2810, 2830
PR30	Combination 10:1/Direct Probe	UHF	Scopes: 1431, 1440, 1460, 1465, 1470
PR31	Combination 10:1/Direct Probe	BNC	Scopes: 1471, 1471B, 1461
PR32	RF Detector/Demodulator Probe	BNC	Scopes: 1474, 1472C, 1472B, 1471B, 1471, 1461
PR34	10:1/Direct Low-Capacitance Probe	UHF	Scopes: 1472, 1470, 1465, 1460, 1440, 1431
PR35	10:1/Direct Low-Capacitance Probe	BNC	Scopes: 1472C, 1472B, 1471B, 1471, 1461
PR36	10:1/Direct Low-Capacitance Probe	BNC	Scopes: 1474, 1472C, 1472B, 1471, 1471B, 1461
PR37	Deluxe 10:1/Direct Probe	BNC	Scopes: 1474, 1472C, 1472B, 1471B, 1471, 1461 Frequency Counters: 1801, 1820, 1850
PR43	AC/DC/OHMS Probe	Mic	Meters: 175, 177, 375
PR151	RF Demodulator Probe	Mic	Meters: 175, 177, 375 Generator: 415 Scope: 1450
TP41	Impedance-Matching RF Cable (75/300 Ohms)	Mic	Generator: 415

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